Draft

Total Maximum Daily Load

Evaluation

for

Thirty-Two Stream Segments

in the

Coosa River Basin

for

Bacteria

Submitted to:
The U.S. Environmental Protection Agency
Region 4
Atlanta, Georgia

Submitted by:
The Georgia Department of Natural Resources
Environmental Protection Division
Atlanta, Georgia

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EXECUTIVE SUMMARY

The State of Georgia Environmental Protection Division (GA EPD) assesses its waterbodies for compliance with water quality standards criteria established for their designated uses as required by the Federal Clean Water Act (CWA). Assessed waterbodies are placed into one of three categories, supporting designated use, not supporting designated use, or assessment pending, depending on water quality assessment results. These waterbodies are found on Georgia's 2022 305(b) list as required by that section of the CWA that defines the assessment process and are published in *Water Quality in Georgia 2020-2021* (GA EPD, 2022). This document is available on the Georgia Environmental Protection Division (GA EPD) website.

The subset of the waterbodies that do not meet designated uses on the 305(b) list are also assigned to Georgia's 303(d) list, named after that section of the CWA. Although the 305(b) and 303(d) lists are two distinct requirements under the CWA, Georgia reports both lists in one combined format called the Integrated 305(b)/303(d) List, which is found in Appendix A of *Water Quality in Georgia 2020-2021* (GA EPD, 2022). Waterbodies on the 303(d) list are denoted as Category 5, and are required to have a Total Maximum Daily Load (TMDL) evaluation for the water quality constituent(s) in violation of the water quality standard(s).

The TMDL formulations in this document are based on impaired segments contained in the 2022 305(b)/303(d) List. The TMDL process establishes the allowable pollutant loadings or other quantifiable parameters for a waterbody based on the relationship between pollutant sources and instream water quality conditions. This allows water quality-based controls to be developed to reduce pollution and restore and maintain water quality.

Every waterbody in the State has one or more designated uses, and each designated use has water quality criteria established to protect it. Waterbodies in Georgia are assessed based on the 305(b/303(d) Listing Assessment Methodology included in Appendix A of *Water Quality in Georgia 2020-2021*, as such GA EPD has placed twenty-two (22) stream segments in the Coosa River Basin on the 303(d) list of impaired waters because it was assessed as "not supporting" its designated use of "Fishing" due to violation of the fecal coliform water quality criteria. The EPA approved water quality criteria in place when the 2022 Integrated 305(b)/303(d) List was developed and approved are as follows:

> For the months of May through October, when water contact recreation activities are expected to occur, fecal coliform not to exceed a geometric mean of 200 counts per 100 mL based on at least four samples collected from a given sampling site over a 30-day period at intervals not less than 24 hours. Should water quality and sanitary studies show fecal coliform levels from non-human sources exceed 200 counts per 100 mL (geometric mean) occasionally, then the allowable geometric mean fecal coliform shall not exceed 300 counts per 100 mL in lakes and reservoirs and 500 counts per 100 mL in free flowing freshwater streams. For the months of November through April, fecal coliform not to exceed a geometric mean of 1,000 counts per 100 mL based on at least four samples collected from a given sampling site over a 30-day period at intervals not less than 24 hours and not to exceed a maximum of 4,000 counts per 100 mL for any sample. The State does not encourage swimming in these surface waters since a number of factors which are beyond the control of any State regulatory agency contribute to elevated levels of bacteria.

A waterbody is assessed as "not supporting" its use if more than ten percent of the geometric means are greater than their seasonal waterbody specific criteria or if more than ten percent of the samples exceed the single sample criteria.

In January 2022, the Georgia DNR Board adopted new bacteria criteria for “Fishing” and “Drinking Water” designated uses using the bacterial indicators *E. coli* and enterococci. These bacteria are better indicators for human health illnesses. The adopted criteria have the same estimated illness rate (8 per 1000 swimmers) as the previously established fecal coliform criteria. EPA approved the proposed criteria on August 31, 2022. Since this TMDL was written after EPA approved the new bacteria criteria, the TMDL will use both bacterial indicators. Where the current *E. coli* load cannot be determined, the TMDL will use a 0.63 conversion factor to convert from fecal coliform standards to *E. coli* standards*,* based on the 30-day geometric mean water quality standard. The current water quality criteria approved August 31, 2022, are as follows:

> For the months of May through October, when primary water contact recreation activities are expected to occur, culturable *E. coli* not to exceed a geometric mean of 126 counts per 100 mL based on at least four samples collected from a given sampling site over a 30-day period at intervals not less than 24 hours. There shall be no greater than a ten percent excursion frequency of an *E. coli* statistical threshold value (STV) of 410 counts per 100 mL in the same 30-day interval. For the months of November through April, culturable *E. coli* not to exceed a geometric mean of 265 counts per 100 mL based on at least four samples collected from a given sampling site over a 30-day period at intervals not less than 24 hours. There shall be no greater than a ten percent excursion frequency of an *E. coli* statistical threshold value (STV) of 861 counts per 100 mL in the same 30-day interval.

A waterbody is assessed as “not supporting” its use if more than ten percent of the geometric means are greater than their seasonal criteria or if more than ten percent of the samples exceeded the STV water quality criteria cited above. An important part of the TMDL analysis is the identification of potential source categories. Sources are broadly classified as either point or nonpoint sources. A point source is defined as a discernable, confined, and discrete conveyance from which pollutants are or may be discharged to surface waters. Nonpoint sources are diffuse, and generally, but not always, involve accumulated fecal coliform bacteria that wash off land surfaces following storm events.

The process of developing fecal coliform bacteria TMDLs for listed segments in the Coosa River Basin involved the determination of the following:

- The current critical bacterial load to the stream under existing conditions;
- The TMDL for similar conditions under which the current critical load was determined; and
- The percent reduction in the current critical bacterial load necessary to achieve the TMDL.

The calculation of the bacterial load at any point in a stream requires the bacterial concentration and stream flow. The availability of water quality and flow data varies considerably among the listed segments. The Loading Curve Approach was used to determine the current fecal coliform load and TMDL. The bacterial loads and required reductions for each of the listed segments are summarized in Table 1 below.

Point and nonpoint source management practices should be used to help reduce bacteria source loads. The amount of bacteria delivered to a stream is difficult to determine. However, the use of management practices should improve stream water quality, and future monitoring will provide a measurement of TMDL implementation.

Table 1: Bacterial Loads and Required Bacterial Load Reductions

Assessment Unit ID	Stream Segment	Description	Bacterial Indicator	Current Load (counts/ 30 days)	TMDL Components					Reduction Required
					WLA (counts/ 30 days)(1)	WLAsw (counts/ 30 days)	LA (counts/ 30 days)	MOS (counts/ 30 days)	TMDL (counts/ 30 days)	
GAR031501050514	Alpine Creek	Unnamed Tributary at Peach Orchard Road to Stateline	Fecal coliform	1.57E+11	1.16E+09	--	5.49E+10	6.23E+09	6.23E+10	60%
			E. coli	(2)	7.30E+08	--	3.46E+10	3.92E+09	3.92E+10	Undetermined (3)
GAR031501030207	Bow Creek	Headwaters to Oostanaula River	Fecal coliform	7.10E+11	--	--	8.81E+10	9.79E+09	9.79E+10	86%
			E. coli	2.18E+11	--	--	4.73E+10	5.26E+09	5.26E+10	76%
GAR031501020806	Crane Eater Creek	Headwaters to Coosawattee River	Fecal coliform	1.17E+11	--	--	3.91E+10	4.34E+09	4.34E+10	63%
			E. coli	2.47E+12	--	--	8.70E+11	9.67E+10	9.67E+11	61%
GAR031501010513	Dead Mans Branch	Headwaters to Polecat Creek	Fecal coliform	1.15E+13	--	--	8.30E+11	9.22E+10	9.22E+11	92%
			E. coli	7.29E+10	--	--	3.84E+10	4.27E+09	4.27E+10	41%
GAR031501030512	East Armuchee Creek	Dry Creek to West Armuchee Creek	Fecal coliform	4.34E+11	--	--	1.48E+11	1.65E+10	1.65E+11	62%
			E. coli	(2)	--	--	9.33E+10	1.04E+10	1.04E+11	Undetermined (3)
GAR031501040312	Etowah River	Amicalola Creek to Yellow Creek	Fecal coliform	4.40E+12	2.93E+10	1.58E+10	2.74E+12	3.10E+11	3.10E+12	30%
			E. coli	1.42E+13	1.84E+10	2.72E+10	4.73E+12	5.30E+11	5.30E+12	63%
GAR031501040313	Etowah River	Yellow Creek to Brewton Creek*	Fecal coliform	4.34E+12	2.93E+10	1.58E+10	2.95E+12	3.32E+11	3.32E+12	23%
			E. coli	1.11E+13	1.84E+10	2.72E+10	5.08E+12	5.69E+11	5.69E+12	49%
GAR031501041410	Euharlee Creek	Simpson Creek to Tributary 0.2 miles downstream of U.S. 278	Fecal coliform	1.36E+11	3.51E+10	--	2.09E+10	6.23E+09	6.23E+10	54%
			E. coli	(2)	2.21E+10	--	1.32E+10	3.92E+09	3.92E+10	Undetermined (3)
GAR031501020409	Flat Creek	Headwaters to S.R. 382	Fecal coliform	2.62E+11	--	--	7.71E+10	8.57E+09	8.57E+10	67%
			E. coli	(2)	--	--	4.86E+10	5.40E+09	5.40E+10	Undetermined (3)
GAR031501020611	Fuller Branch	Brannon Lake to Salacoa Creek	Fecal coliform	1.44E+10	--	--	6.85E+09	7.61E+08	7.61E+09	47%
			E. coli	1.20E+10	--	--	4.58E+09	5.09E+08	5.09E+09	58%
GAR031501010314	Ketchum Branch	Headwaters to Coahula Creek	Fecal coliform	5.45E+09	4.45E+08	6.81E+07	1.23E+09	1.93E+08	1.93E+09	65%
			E. coli	(2)	2.80E+08	4.29E+07	7.72E+08	1.22E+08	1.22E+09	Undetermined (3)
GAR031501020605	Lick Creek	Redbud Creek to Salacoa Creek	Fecal coliform	4.33E+11	--	--	2.13E+11	2.37E+10	2.37E+11	45%
			E. coli	(2)	--	--	1.34E+11	1.49E+10	1.49E+11	Undetermined (3)

Assessment Unit ID	Stream Segment	Description	Bacterial Indicator	Current Load (counts/ 30 days)	TMDL Components					Reduction Required
					WLA (counts/ 30 days)(1)	WLAsw (counts/ 30 days)	LA (counts/ 30 days)	MOS (counts/ 30 days)	TMDL (counts/ 30 days)	
GAR031501010316	Mill Creek	North Fork Mill Creek to Haig Mill Creek	Fecal coliform	1.74E+11	1.76E+09	7.69E+09	6.85E+10	8.66E+09	8.66E+10	50%
			E. coli	(2)	1.11E+09	4.84E+09	4.32E+10	5.46E+09	5.46E+10	Undetermined (3)
GAR031501040703	Moore Creek	Headwaters to Shoal Creek	Fecal coliform	2.10E+11	7.03E+07	--	3.99E+10	4.44E+09	4.44E+10	79%
			E. coli	(2)	4.43E+07	--	2.51E+10	2.80E+09	2.80E+10	Undetermined (3)
GAR031501020609	Ninetynine Branch	Headwaters to Salacoa Creek	Fecal coliform	1.78E+11	--	--	4.48E+10	4.98E+09	4.98E+10	72%
			E. coli	(2)	--	--	2.82E+10	3.14E+09	3.14E+10	Undetermined (3)
GAR031501041311	Pettit Creek	Aubrey Lake to Satterfield Branch	Fecal coliform	1.45E+14	--	3.27E+12	2.93E+13	3.62E+12	3.62E+13	75%
			E. coli	(2)	--	7.03E+11	6.31E+12	7.80E+11	7.80E+12	Undetermined (3)
GAR031501020601	Pin Hook Creek	Pickens Co. Line to Salacoa Creek	Fecal coliform	2.15E+11	2.34E+09	--	1.07E+11	1.22E+10	1.22E+11	43%
			E. coli	(2)	1.48E+09	--	6.75E+10	7.66E+09	7.66E+10	Undetermined (3)
GAR031501020610	Redbud Creek	Headwaters to Defoor Walters Lake	Fecal coliform	4.19E+11	--	--	9.84E+10	1.09E+10	1.09E+11	74%
			E. coli	3.08E+10	--	--	9.47E+09	1.05E+09	1.02E+10	66%
GAR031501030211	Robbins Creek	Headwaters to Oostanaula River	Fecal coliform	3.16E+10	1.16E+08	--	2.52E+10	2.81E+09	2.81E+10	11%
			E. coli	(2)	7.30E+07	--	1.59E+10	1.77E+09	1.77E+10	Undetermined (3)
GAR031501041407	Simpson Creek	Headwaters to Hutchings Creek	Fecal coliform	4.76E+10	--	--	1.34E+10	1.49E+09	1.49E+10	69%
			E. coli	2.32E+11	--	--	3.73E+10	4.14E+09	4.14E+10	82%
GAR031501050118	Tanyard Branch	Tributary 200 feet upstream of U.S. 278 to Big Cedar Creek/Cedar Creek	Fecal coliform	4.69E+11	--	--	2.62E+10	2.91E+09	2.91E+10	94%
			E. coli	(2)	--	--	1.65E+10	1.83E+09	1.83E+10	Undetermined (3)
GAR031501030212	Town Creek	Moss Lake to the Oostanaula River	Fecal coliform	1.57E+11	--	--	3.80E+10	4.22E+09	4.22E+10	73%
			E. coli	1.77E+12	--	--	5.01E+10	5.57E+09	5.57E+10	97%
Revised TMDLs										
GAR031501050402	Chappel Creek	Tributary 200 feet downstream of US 27 to the Chattooga River/Trion	Fecal coliform	(4)	--	--	9.88E+10	1.10E+10	1.10E+11	Undetermined (3)
			E. coli	(4)	--	--	6.22E+10	6.92E+09	6.92E+10	Undetermined (3)
GAR031501040805	Chastain Branch	Tributary to Noonday Creek	Fecal coliform	(4)	--	5.94E+09	4.42E+09	1.15E+09	1.15E+10	Undetermined (3)
			E. coli	(4)	--	3.74E+09	2.78E+09	7.25E+08	7.25E+09	Undetermined (3)

Assessment Unit ID	Stream Segment	Description	Bacterial Indicator	Current Load (counts/ 30 days)	TMDL Components					Reduction Required
					WLA (counts/ 30 days)(1)	WLAsw (counts/ 30 days)	LA (counts/ 30 days)	MOS (counts/ 30 days)	TMDL (counts/ 30 days)	
GAR031501010502	Conasauga River	Hwy 286 to Holly Creek	Fecal coliform	(4)	5.06E+10	1.94E+11	6.71E+12	7.72E+11	7.72E+12	Undetermined (3)
			E. coli	(4)	3.19E+10	1.22E+11	4.22E+12	4.87E+11	4.87E+12	Undetermined (3)
GAR031501010511	Conasauga River	Holly Creek to Thomason Creek	Fecal coliform	(4)	5.09E+10	2.77E+11	7.17E+12	8.33E+11	8.33E+12	Undetermined (3)
			E. coli	(4)	3.21E+10	1.74E+11	4.52E+12	5.25E+11	5.25E+12	Undetermined (3)
GAR031501020202	Cox Creek	Headwaters to Ellijay River	Fecal coliform	(4)	--	--	2.34E+10	2.60E+09	2.60E+10	Undetermined (3)
			E. coli	(4)	--	--	1.48E+10	1.64E+09	1.64E+10	Undetermined (3)
GAR031501041001	Kellogg Creek	Lake Allatoona Tributary	Fecal coliform	(4)	--	7.88E+09	1.01E+10	2.00E+09	2.00E+10	Undetermined (3)
			E. coli	(4)	--	4.97E+09	6.37E+09	1.26E+09	1.26E+10	Undetermined (3)
GAR031501030502	Lavender Creek	Headwaters to Armuchee Creek	Fecal coliform	(4)	--	--	1.03E+11	1.14E+10	1.14E+11	Undetermined (3)
			E. coli	(4)	--	--	6.48E+10	7.20E+09	7.20E+10	Undetermined (3)
GAR031501041003	Rowland Springs Branch	Lake Allatoona Tributary	Fecal coliform	(4)	--	1.60E+09	3.16E+10	3.69E+09	3.69E+10	Undetermined (3)
			E. coli	(4)	--	1.01E+09	1.99E+10	2.32E+09	2.32E+10	Undetermined (3)
GAR031501040701	Shoal Creek	Hwy 140 to Lake Allatoona	Fecal coliform	(4)	7.03E+07	9.76E+06	6.64E+11	7.38E+10	7.38E+11	Undetermined (3)
			E. coli	(4)	4.43E+07	6.15E+06	4.18E+11	4.65E+10	4.65E+11	Undetermined (3)
GAR031501041004	Stamp Creek	Headwaters to Lake Allatoona	Fecal coliform	(4)	--	1.88E+07	1.75E+11	1.95E+10	1.95E+11	Undetermined (3)
			E. coli	(4)	--	1.19E+07	1.10E+11	1.23E+10	1.23E+11	Undetermined (3)

Notes:
(1) The assigned bacterial load from the NPDES permitted facility for WLA was determined as the product of the permitted flow and bacteria permit limit.
(2) Sample was not analyzed for *E. coli*, therefore critical load calculation not possible.
(3) Percent reduction could not be determined due to absence of current load calculation.
(4) Critical loading could not be determined due to no samples collected.

1.0 INTRODUCTION

1.1 Background

The State of Georgia assesses its waterbodies for compliance with water quality criteria established for their designated uses as required by the CWA. Assessed waterbodies are placed into one of three categories, supporting designated use, not supporting designated use, or assessment pending, depending on water quality assessment results. These waterbodies are found on Georgia's 2022 305(b) list as required by that section of the CWA that defines the assessment process and are published in *Water Quality in Georgia 2020-2021* (GA EPD, 2022). This document is available on the GA EPD website.

The subset of the waterbodies that do not meet designated uses on the 305(b) list are also assigned to Georgia's 303(d) list, named after that section of the CWA. Although the 305(b) and 303(d) lists are two distinct requirements under the CWA, Georgia reports both lists in one combined format called the Integrated 305(b)/303(d) List, which is found in Appendix A of *Water Quality in Georgia 2020-2021* (GA EPD, 2022). Waterbodies on the 303(d) list are denoted as Category 5, and are required to have a Total Maximum Daily Load (TMDL) evaluation for the water quality constituent(s) in violation of the water quality standard.

The TMDL formulations in this document are based on impaired segments contained in the 2022 305(b)/303(d) List. The TMDL process establishes the allowable pollutant loadings or other quantifiable parameters for a waterbody based on the relationship between pollutant sources and instream water quality conditions. This allows water quality-based controls to be developed to reduce pollution and restore and maintain water quality.

The 303(d) list identifies the stream segments that are not supporting its designated use classification due to exceedances of water quality standards for bacteria. Fecal coliform, *E. coli,* and enterococci bacteria are used as indicators of the potential presence of pathogens in a stream. Table 2 presents the twenty-two (22) stream segments in the Coosa River Basin included on the 2022 303(d) list for exceedances of the fecal coliform standard criteria. Table 3 lists the ten (10) stream segments in the Coosa River Basin where the previously approved TMDLs are being revised.

Table 2: Stream Segments Listed on the 2022 303(d) List for Bacteria in the Coosa River Basin

Stream Segment	Location	Assessment Unit ID	Segment Length (miles)	Designated Use
Alpine Creek	Unnamed Tributary at Peach Orchard Road to Stateline	GAR031501050514	3	Fishing
Bow Creek	Headwaters to Oostanaula River	GAR031501030207	5	Fishing
Crane Eater Creek	Headwaters to Coosawattee River	GAR031501020806	4	Fishing
Dead Mans Branch	Headwaters to Polecat Creek	GAR031501010513	2	Fishing

Stream Segment	Location	Assessment Unit ID	Segment Length (miles)	Designated Use
East Armuchee Creek	Dry Creek to West Armuchee Creek (formerly Furnace Creek to West Armuchee Creek)	GAR031501030512	14.6	Fishing
Etowah River	Amicalola Creek to Yellow Creek	GAR031501040312	5	Fishing
Etowah River	Yellow Creek to Brewton Creek*	GAR031501040313	4	Fishing
Euharlee Creek	Simpson Creek to Tributary 0.2 miles downstream of U.S. 278	GAR031501041410	2	Drinking Water, Fishing
Flat Creek	Headwaters to S.R. 382	GAR031501020409	4.3	Fishing
Fuller Branch	Brannon Lake to Salacoa Creek	GAR031501020611	1	Fishing
Ketchum Branch	Headwaters to Coahula Creek	GAR031501010314	1	Fishing
Lick Creek	Redbud Creek to Salacoa Creek	GAR031501020605	4	Fishing
Mill Creek	North Fork Mill Creek to Haig Mill Creek	GAR031501010316	3	Drinking Water, Fishing
Moore Creek	Headwaters to Shoal Creek	GAR031501040703	4	Fishing
Ninetynine Branch	Headwaters to Salacoa Creek	GAR031501020609	5	Fishing
Pettit Creek	Aubrey Lake to Satterfield Branch	GAR031501041311	6	Fishing
Pin Hook Creek	Pickens Co. Line to Salacoa Creek	GAR031501020601	7.6	Fishing
Redbud Creek	Headwaters to Defoor Walters Lake	GAR031501020610	4	Fishing
Robbins Creek	Headwaters to Oostanaula River	GAR031501030211	4.9	Fishing
Simpson Creek	Headwaters to Hutchings Creek	GAR031501041407	2.6	Fishing
Tanyard Branch	Tributary 200 feet upstream of U.S. 278 to Big Cedar Creek/Cedar Creek	GAR031501050118	1	Fishing
Town Creek	Moss Lake to the Oostanaula River	GAR031501030212	3	Fishing

* The 2022 303(d) list incorrectly gives this as “Yellow River to Brewton Creek”

Table 3: Stream Segments with Revised TMDLs for Bacteria in the Coosa River Basin

Stream Segment	Location	Assessment Unit ID	Segment Length (miles)	Designated Use	Original TMDL Action ID Number, Agency, and Year
Chappel Creek	Tributary 200 feet downstream of US 27 to the Chattooga River/Trion	GAR031501050402	2.8	Fishing	# 241 US EPA 1998
Chastain Branch	Tributary to Noonday Creek	GAR031501040805	2	Fishing	# 244 US EPA 1998
Conasauga River	Hwy 286 to Holly Creek	GAR031501010502	18	Fishing, Drinking Water	# 322 US EPA 1998
Conasauga River	Holly Creek to Thomason Creek	GAR031501010511	14	Fishing	# 322 US EPA 1998
Cox Creek	Headwaters to Ellijay River	GAR031501020202	3	Fishing	# 342 US EPA 1998
Kellogg Creek	Lake Allatoona Tributary	GAR031501041001	3	Fishing	# 597 US EPA 1998
Lavender Creek	Headwaters to Armuchee Creek	GAR031501030502	7.8	Fishing	# 665 US EPA 1998
Rowland Springs Branch	Lake Allatoona Tributary	GAR031501041003	2	Fishing	# 1017 US EPA 1998
Shoal Creek	Hwy 140 to Lake Allatoona	GAR031501040701	15.5	Fishing	# 1071 US EPA 1998
Stamp Creek	Headwaters to Lake Allatoona	GAR031501041004	9.9	Fishing	# 1141 US EPA 1998

1.2 Watershed Description

The Coosa River originates in the north Georgia mountains as the Etowah, Conasauga, Coosawattee, and Chattooga Rivers. The Conasauga River flows north to Tennessee and then south from Tennessee where it converges with the Coosawattee River near Resaca, Georgia, to form the Oostanaula River. The Coosawattee River originates in Ellijay, Georgia, by the merging of the Ellijay and Cartecay Rivers. The Coosawattee flows west from Ellijay, joins with Mountain Creek, and then flows into Carter’s Lake. From Carter’s Lake, the Coosawattee River flows west toward Resaca where it meets the Conasauga to form the Oostanaula River. The Etowah River flows southwest from Lumpkin County to Lake Allatoona. From there it flows west toward Rome, Georgia, where it merges with the Oostanaula River to form the Coosa River. The Coosa River then flows west into Alabama to Lake Weiss. The Chattooga River originates in Walker County and flows southwest to Lake Weiss in Alabama. The Coosa River flows south from Lake Weiss through a series of lakes and eventually joins the Tallapoosa River to form the Alabama River, which ultimately discharges to the Gulf of Mexico. The Coosa River Basin occupies a total area of about 10,059 square miles, of which 4,579 square miles (46 percent) lie in Georgia. The Coosa River Basin contains parts of the Blue Ridge, Piedmont, and Ridge and Valley physiographic provinces that extend throughout the southeastern United States. Figure 1 shows the location of the Coosa River Basin in the State of Georgia. Figure 2 shows the locations of the two hydrologic units within the Coosa River Basin. Figure 3 through 23 indicate the location of the 303(d) listed stream segments in the Coosa River Basin.

The land use characteristics of the Coosa River Basin watersheds were determined using data from the Georgia Land Use Trends (GLUT) for Year 2015. This raster land use trend product was developed by the University of Georgia – Natural Resources Spatial Analysis Laboratory (NARSAL) and follows land use trends for years 1974, 1985, 1991, 1998, 2001, 2005, 2008 and 2015. Some of the NARSAL land use types were reclassified, aggregated into similar land use types, and used in the final watershed characterization. Table 4 lists the watershed land use distribution for the drainage areas of the two stream segments.

1.3 State Water Planning

The Georgia Legislature enacted the Metropolitan North Georgia Water Planning District Act in 2001 to create the Metropolitan North Georgia Water Planning District (MNGWPD) to preserve and protect water resources in the 15-county metropolitan Atlanta area. The MNGWPD is charged with the development of comprehensive regional and watershed specific water resource management plans to be implemented by local governments in the metropolitan Atlanta area. The MNGWPD issued its first water resource management plan documents in 2003.

In 2004, the Georgia Legislature enacted the Comprehensive State-wide Water Management Planning Act to ensure management of water resources in a sustainable manner to support the state's economy, to protect public health and natural systems, and to enhance the quality of life for all citizens on a state-wide level. GA EPD later developed the 2008 Comprehensive State-wide Water Management Plan, which established Georgia’s ten Regional Water Planning Councils (RWPCs) and laid the groundwork for the RWPCs to develop their own Regional Water Plans. The boundaries of these ten RWPCs, in addition to the MNGWPD, are shown in Figure 24. All of the listed waterbodies are located within the boundaries of the Coosa-North Georgia Regional Water Planning Council.

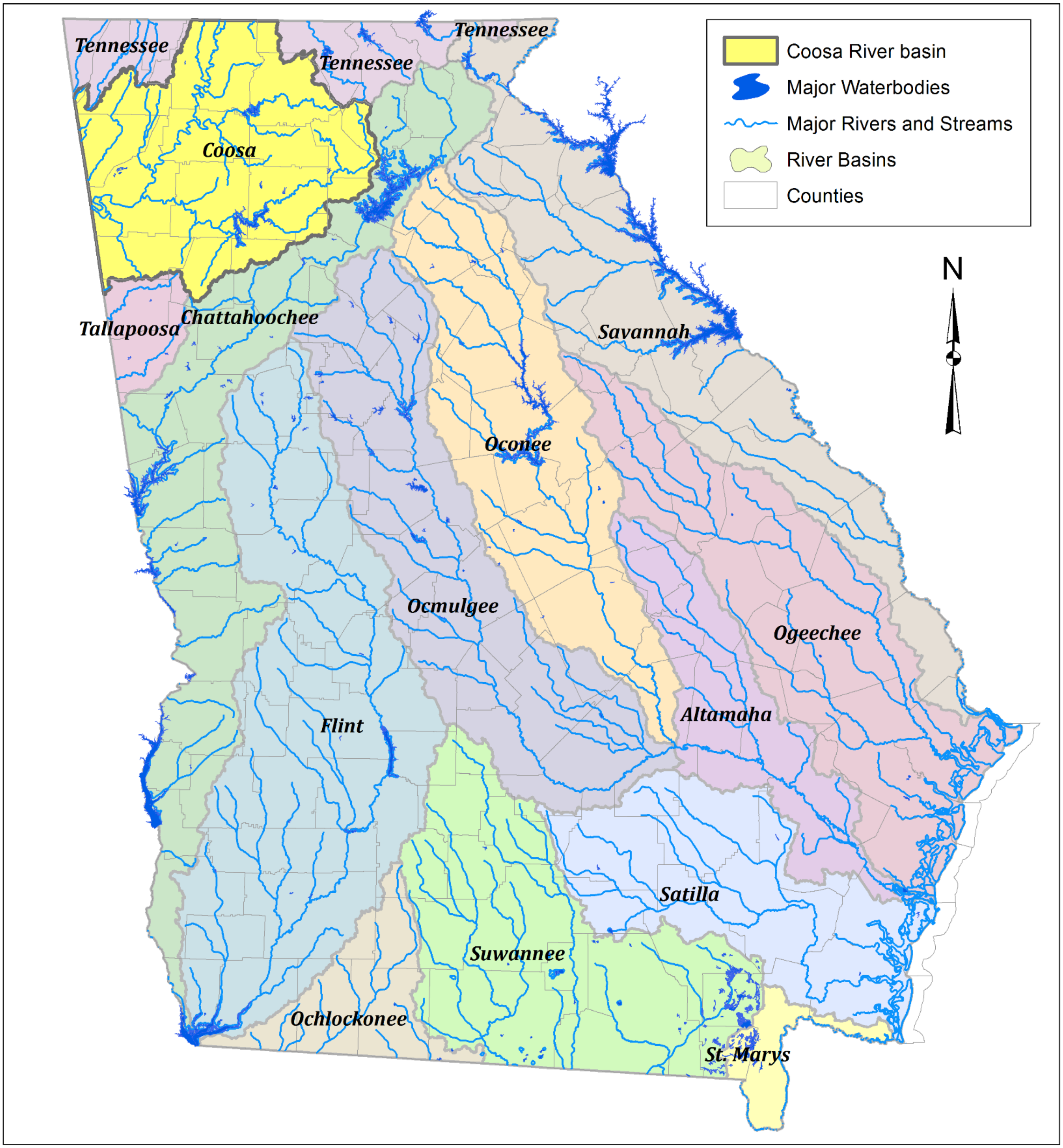

Figure 1: Location of the Coosa River Basin in Georgia

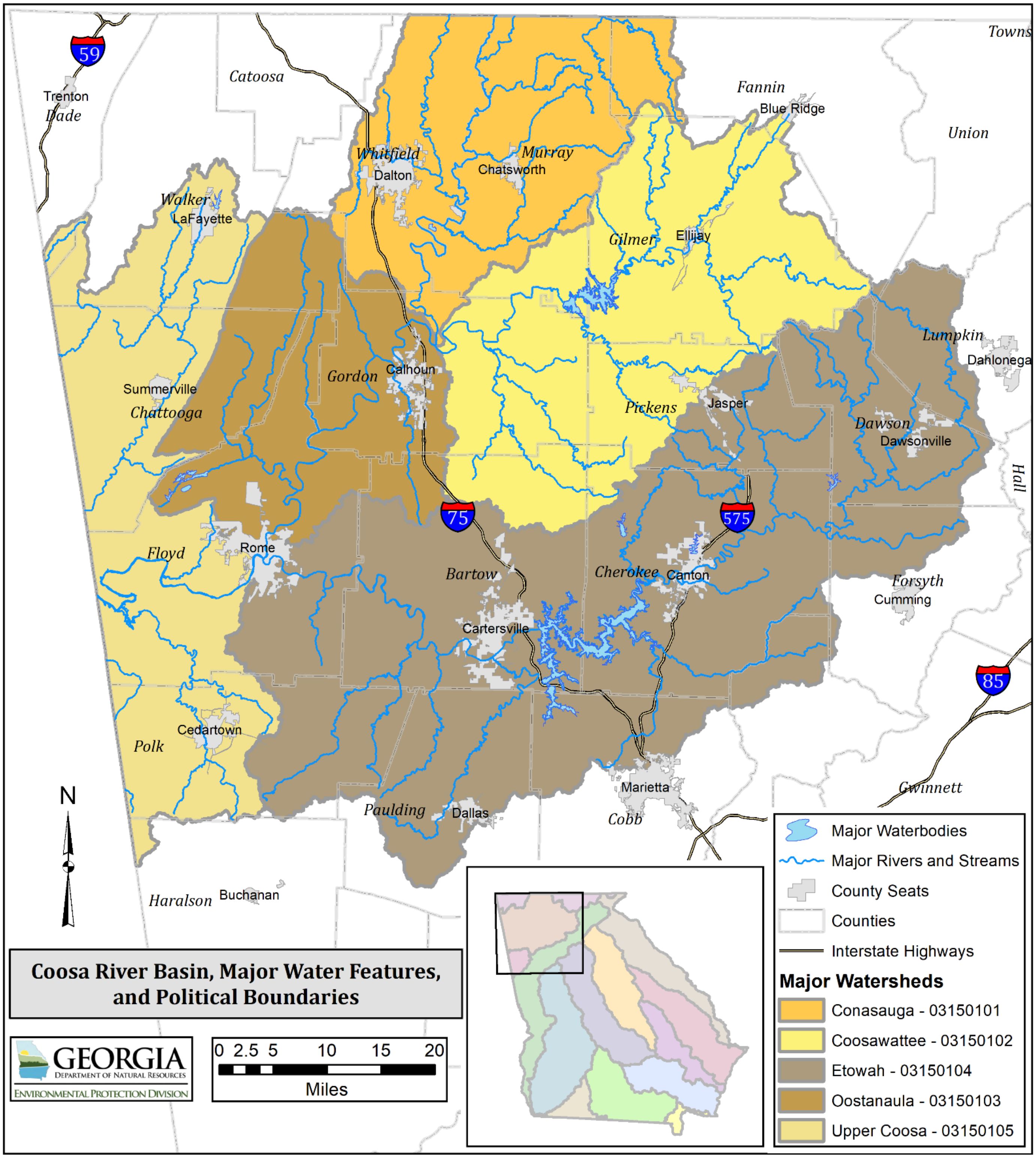

Figure 2: Major Political Boundaries, Water Features, and U.S.G.S. 12-digit HUC

Figure 3: Impaired Stream Segment of Alpine Creek

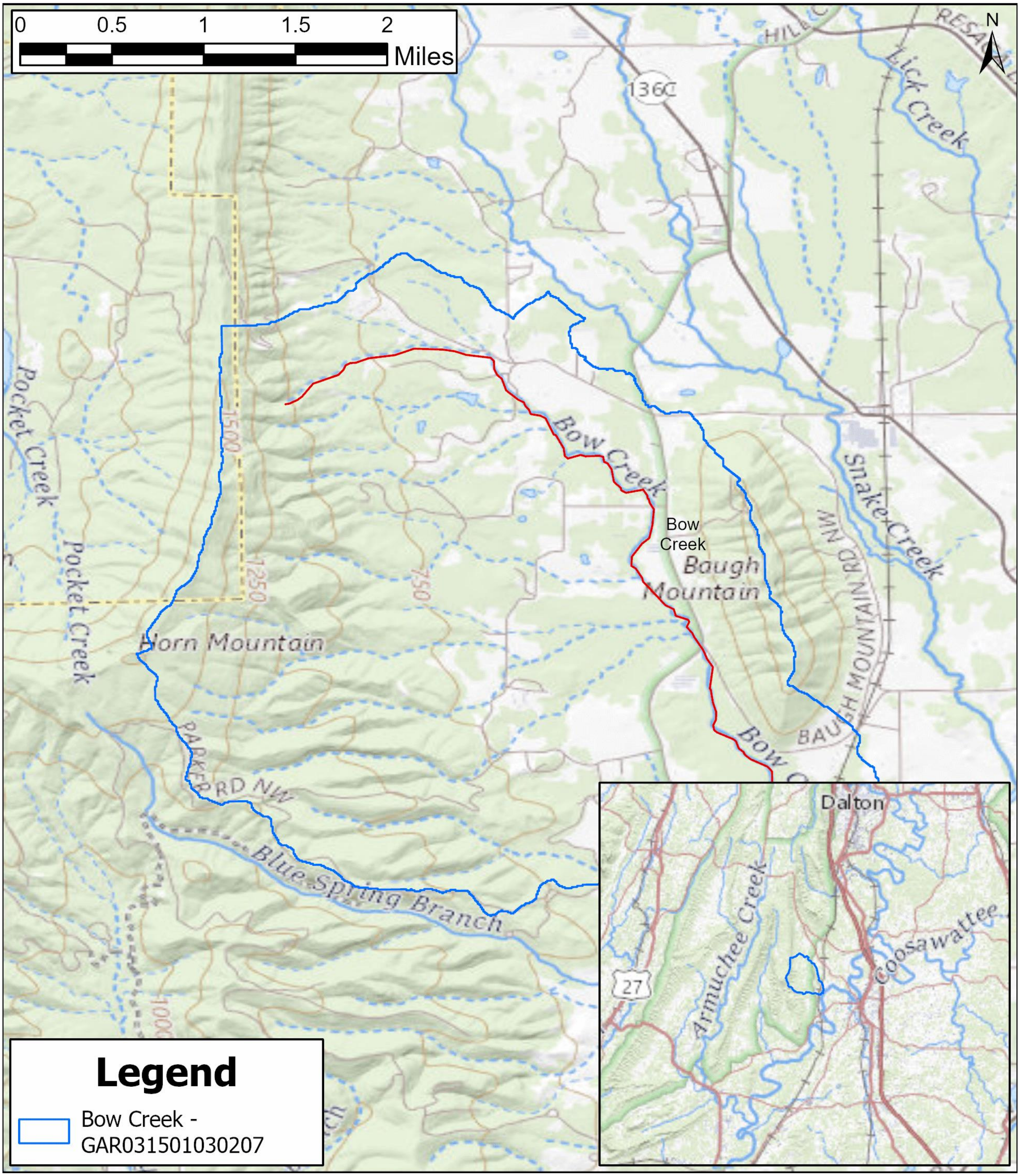

Figure 4: Impaired Stream Segment of Bow Creek

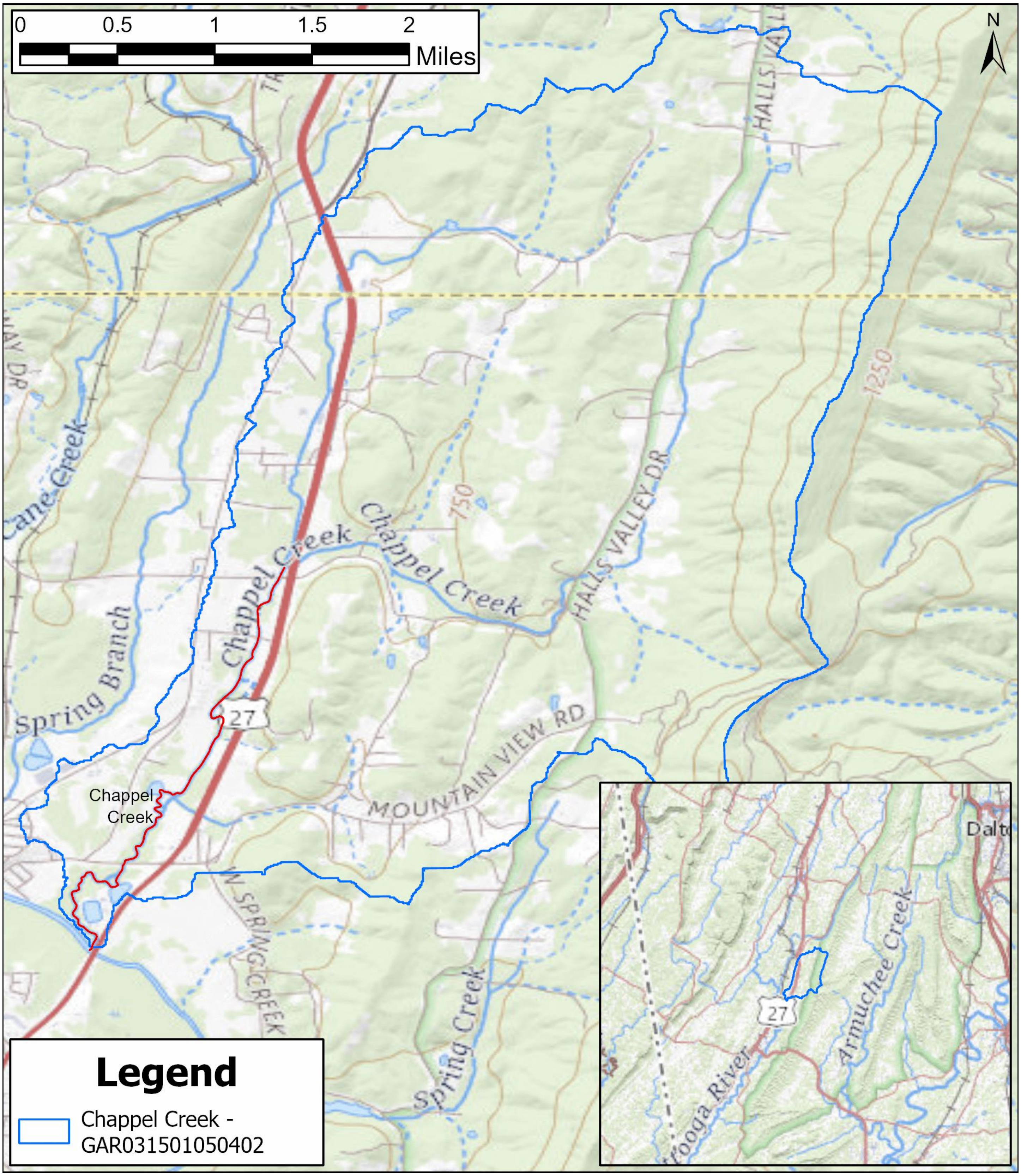

Figure 5: Impaired Stream Segment of Chappel Creek

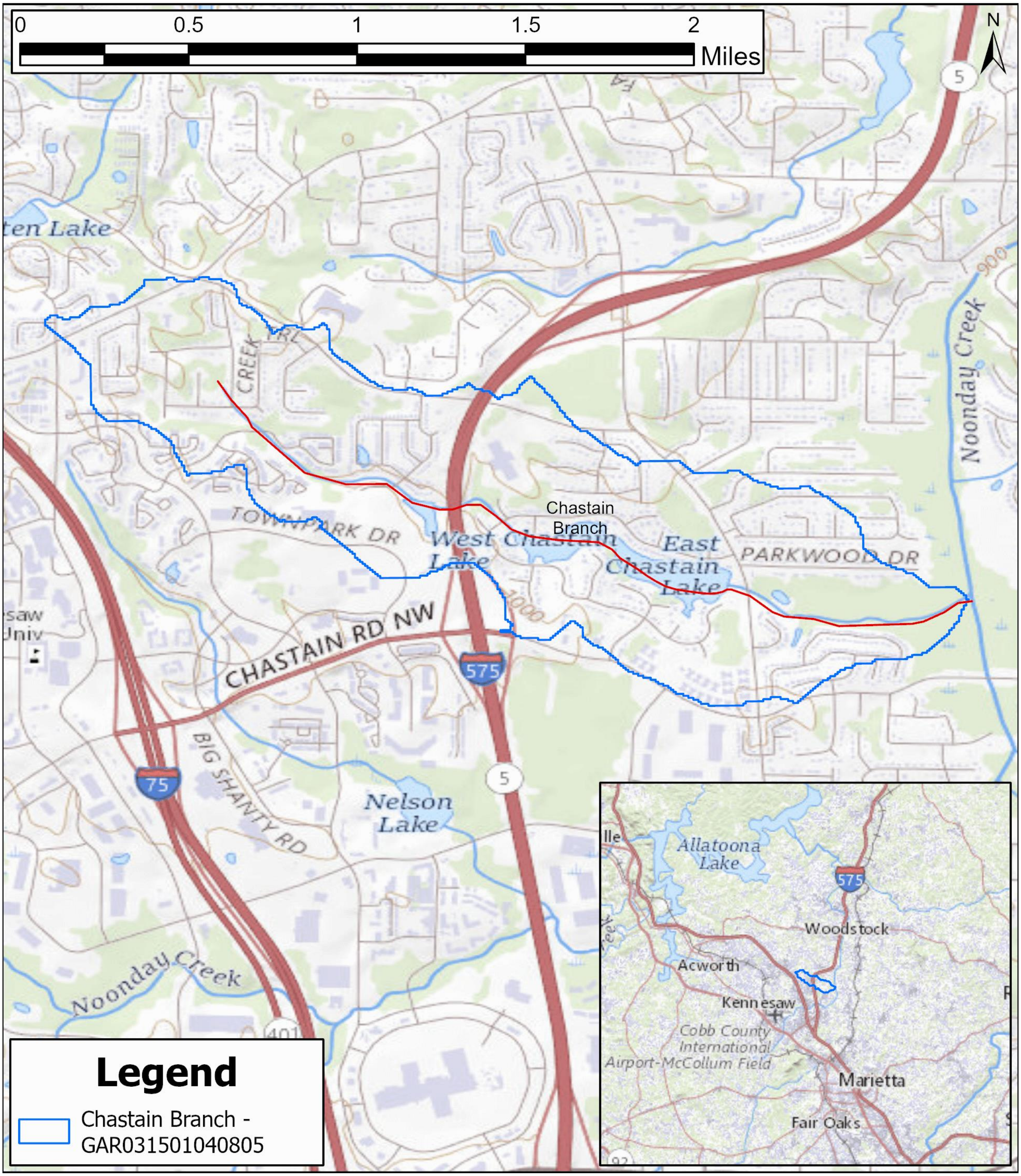

Figure 6: Impaired Stream Segment of Chastain Creek

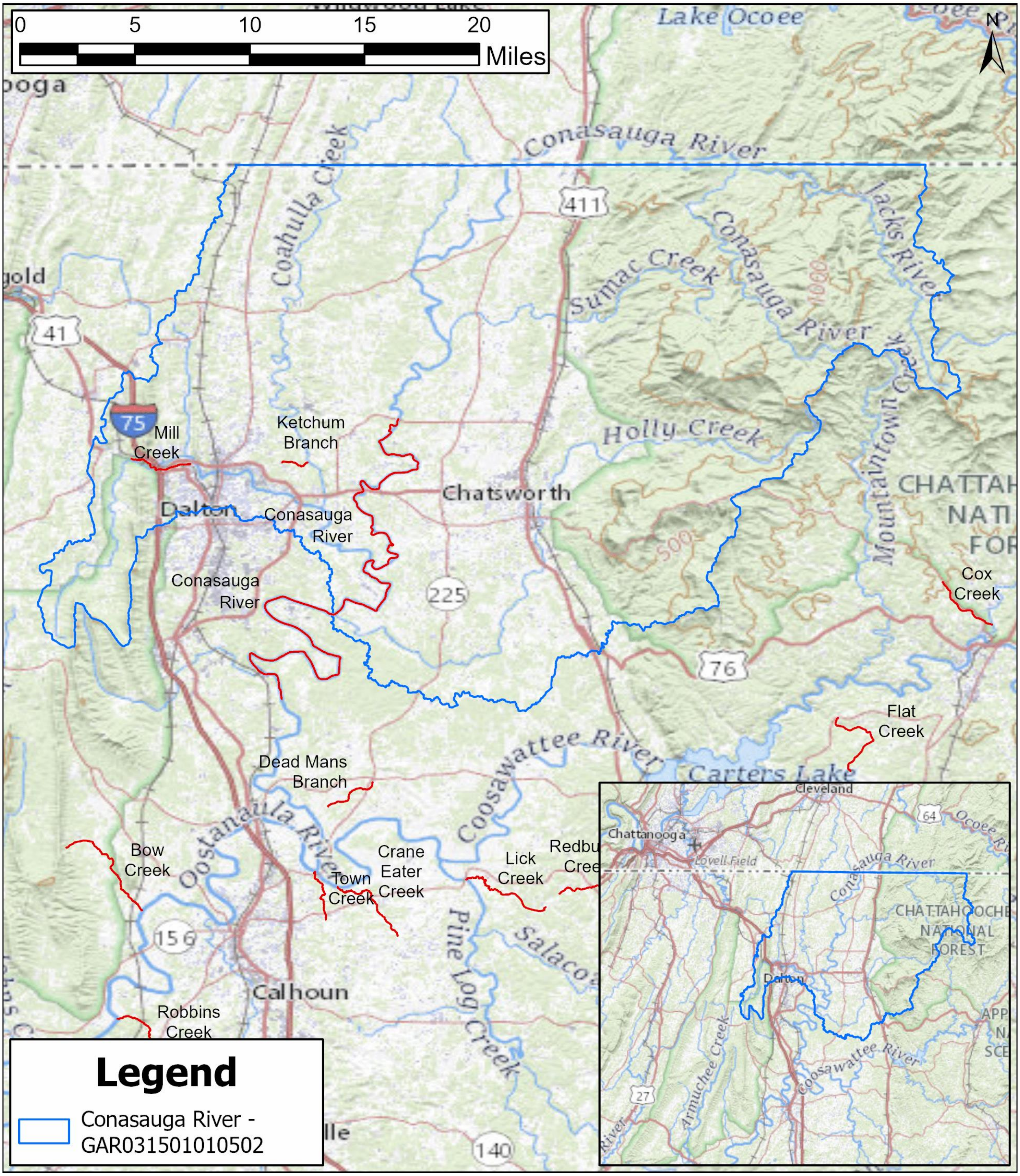

Figure 7: Impaired Stream Segment of Conasauga River (GAR031501010502)

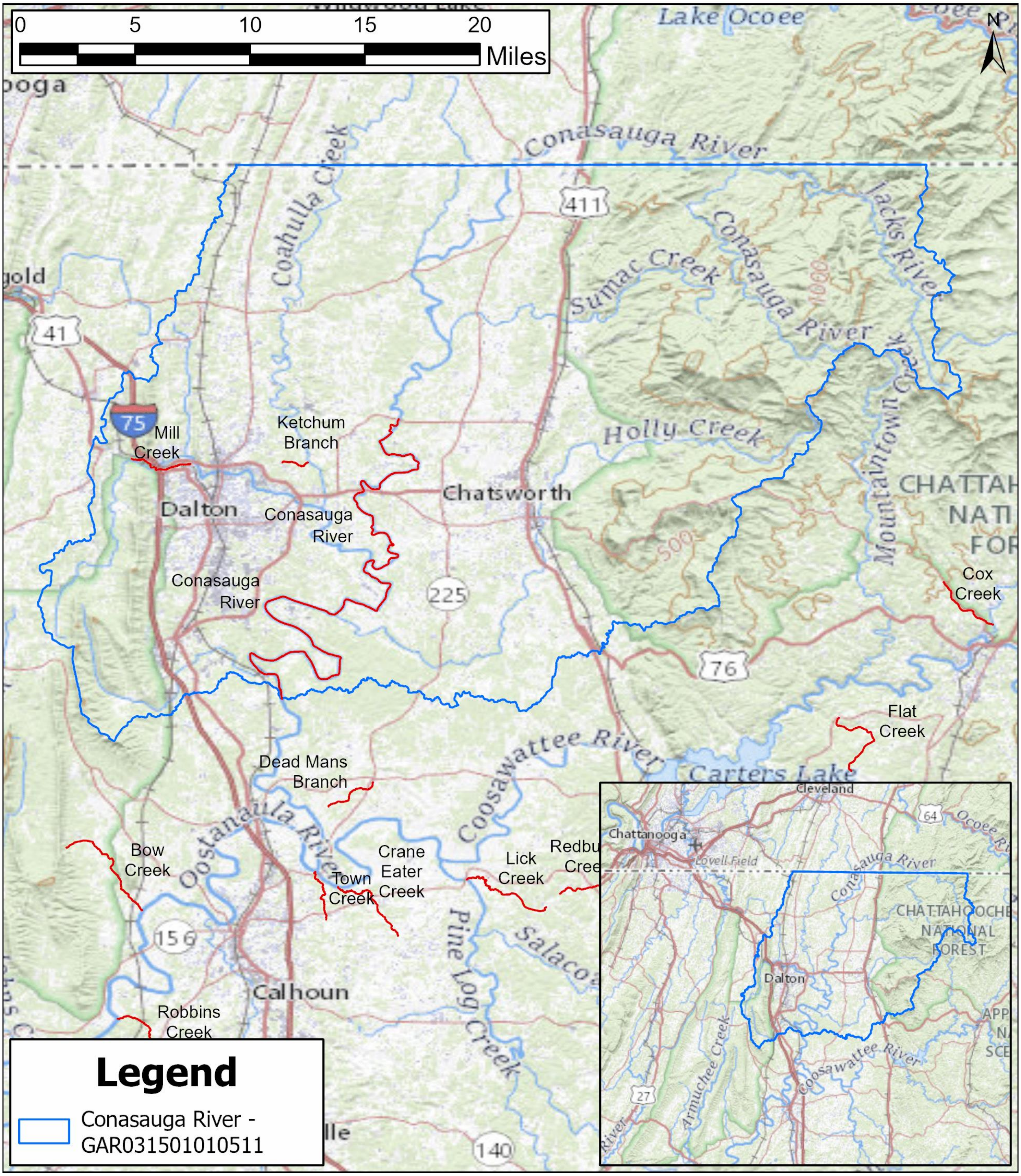

Figure 8: Impaired Stream Segment of Conasauga River (GAR031501010511)

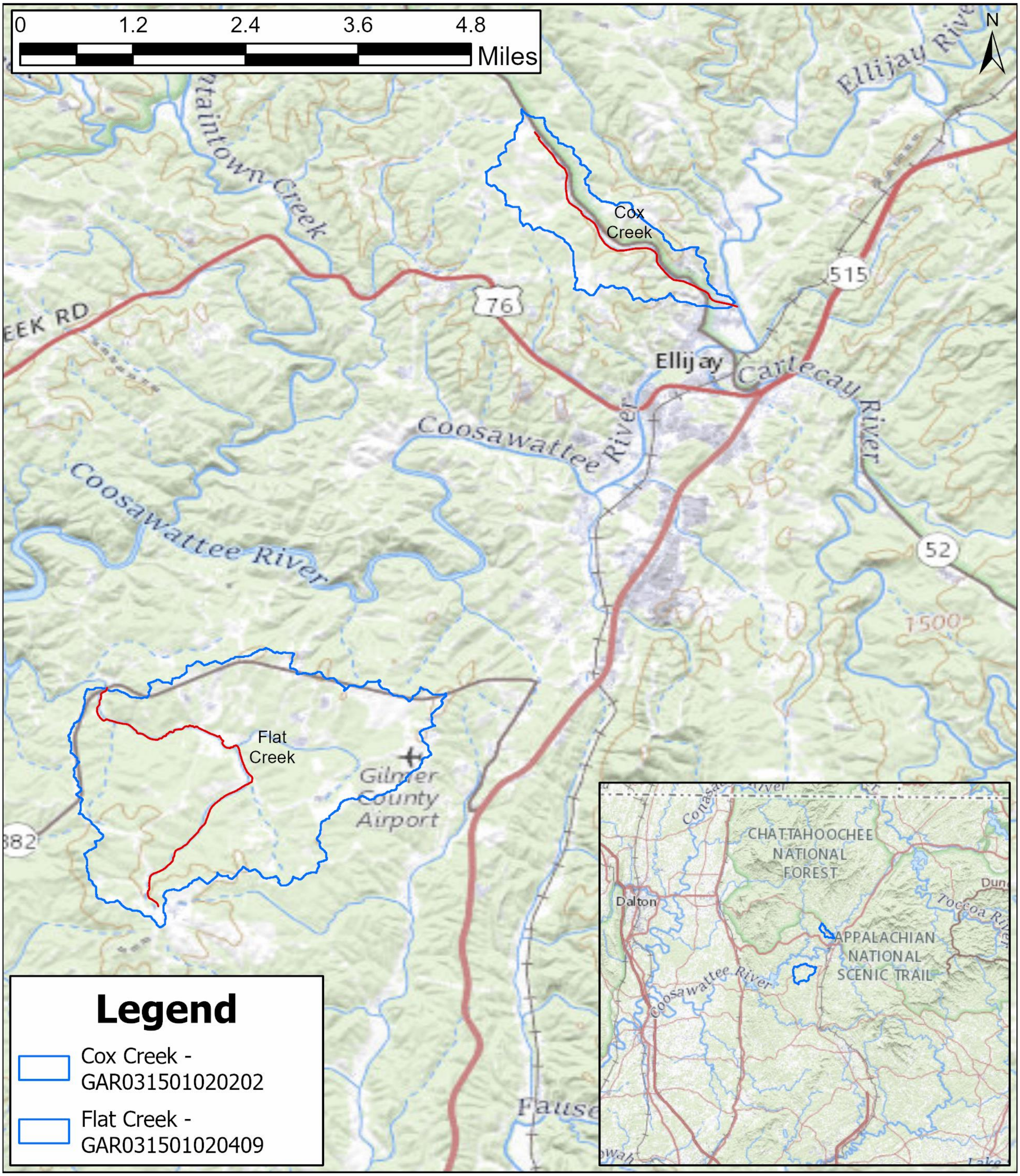

Figure 9: Impaired Stream Segments of Cox Creek and Flat Creek

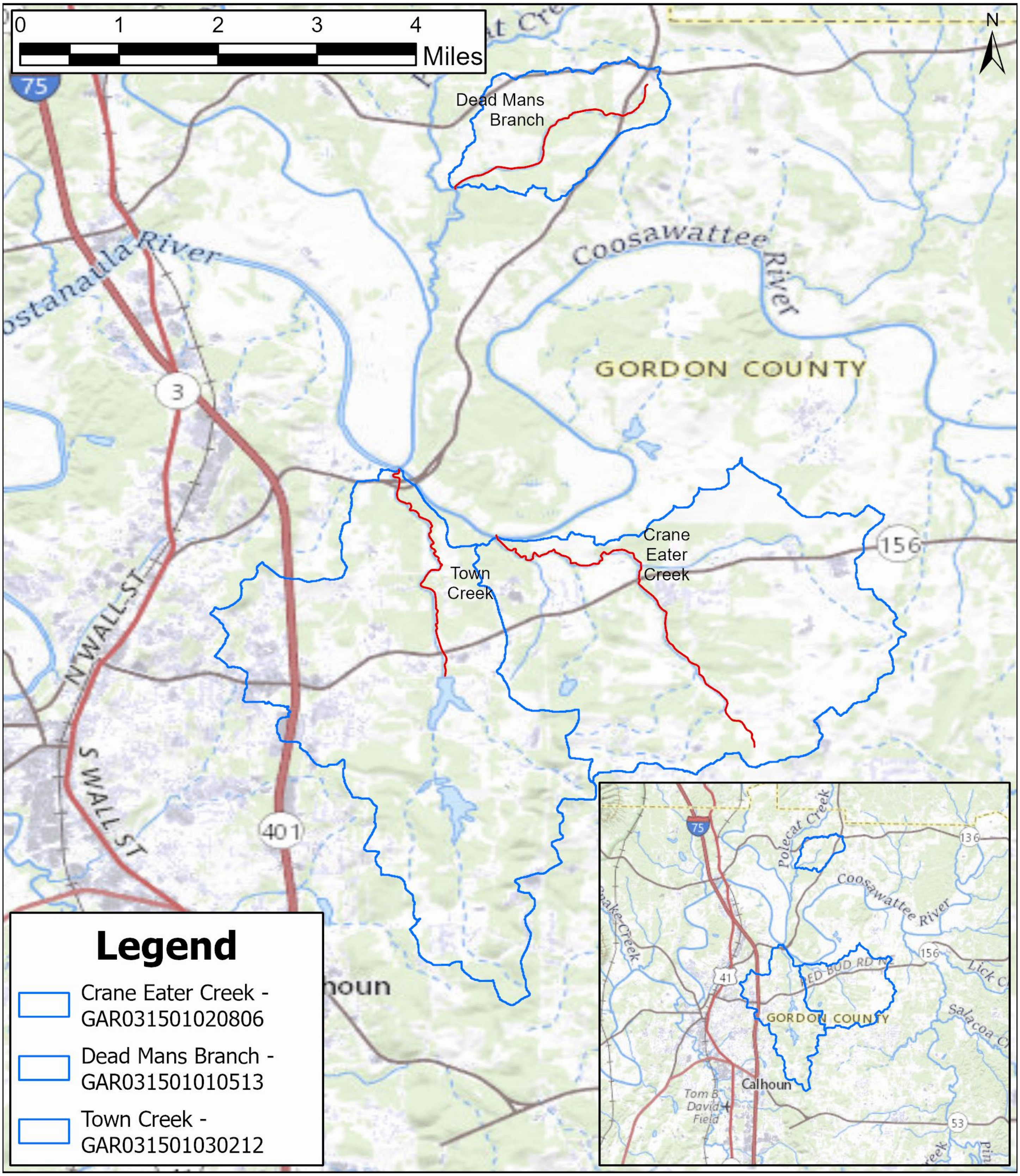

Figure 10: Impaired Stream Segments of Crane Eater Creek, Dead Mans Branch, and Town Creek

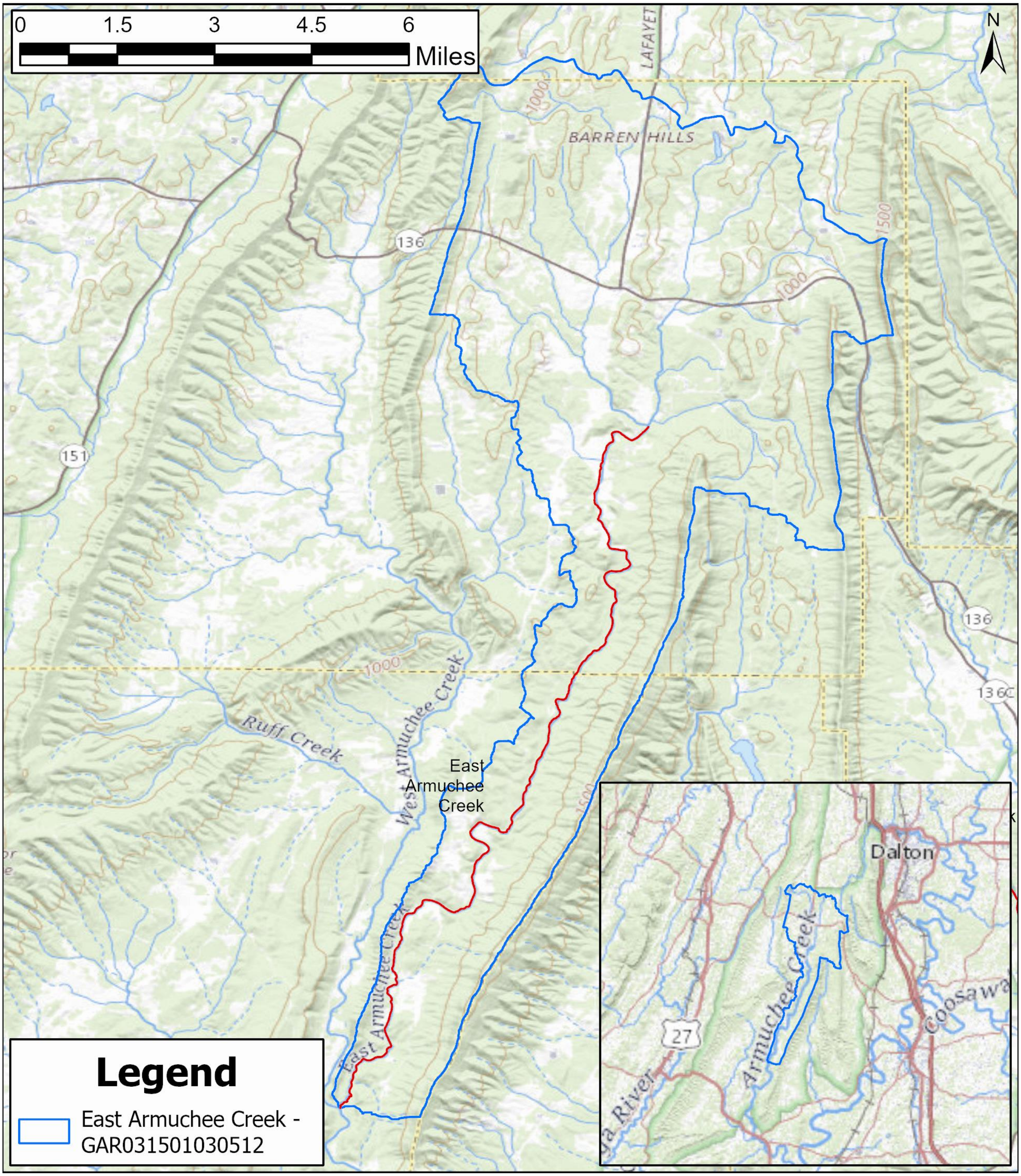

Figure 11: Impaired Stream Segment of East Armuchee Creek

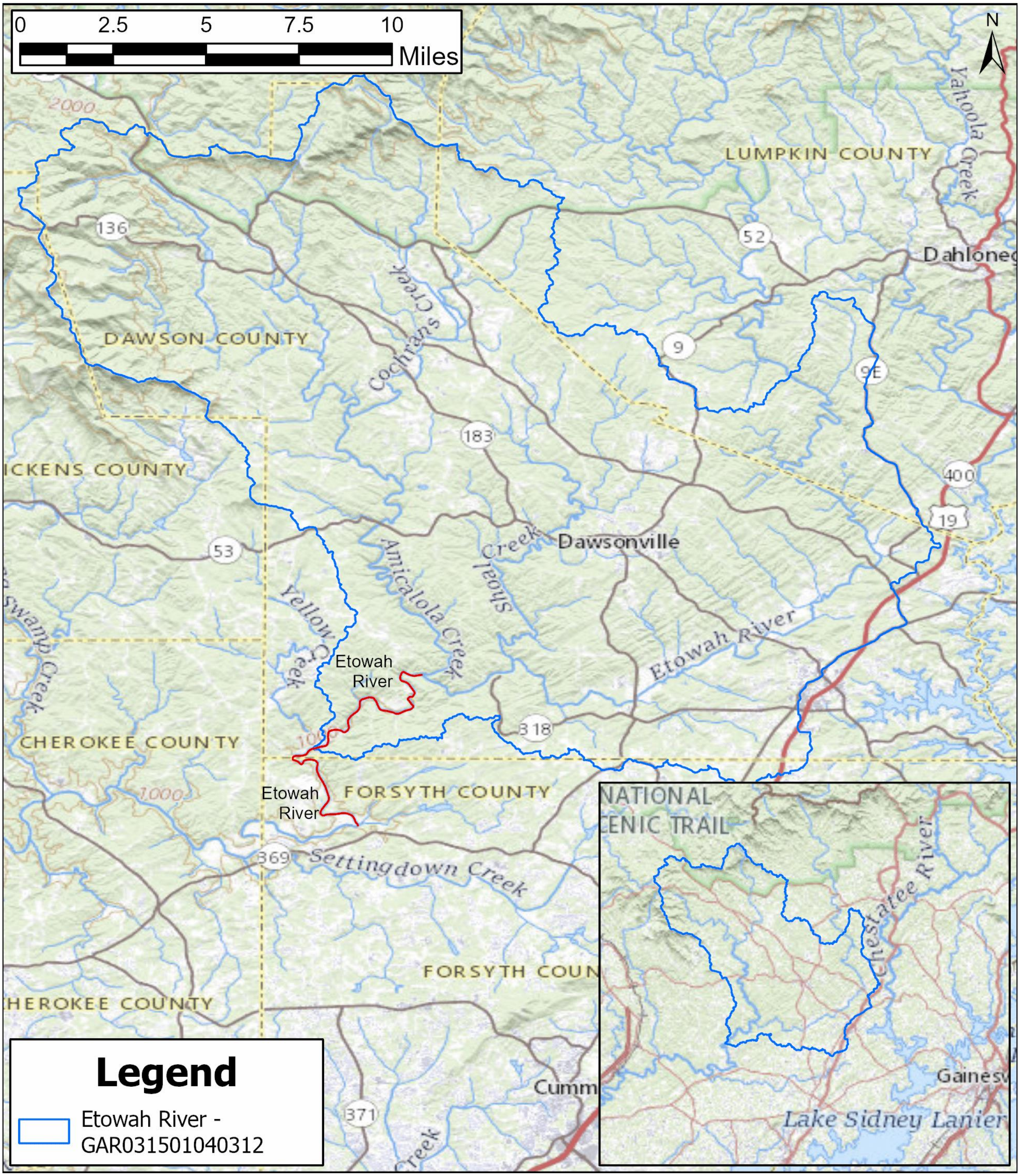

Figure 12: Impaired Stream Segment of Etowah River (GAR031501040312)

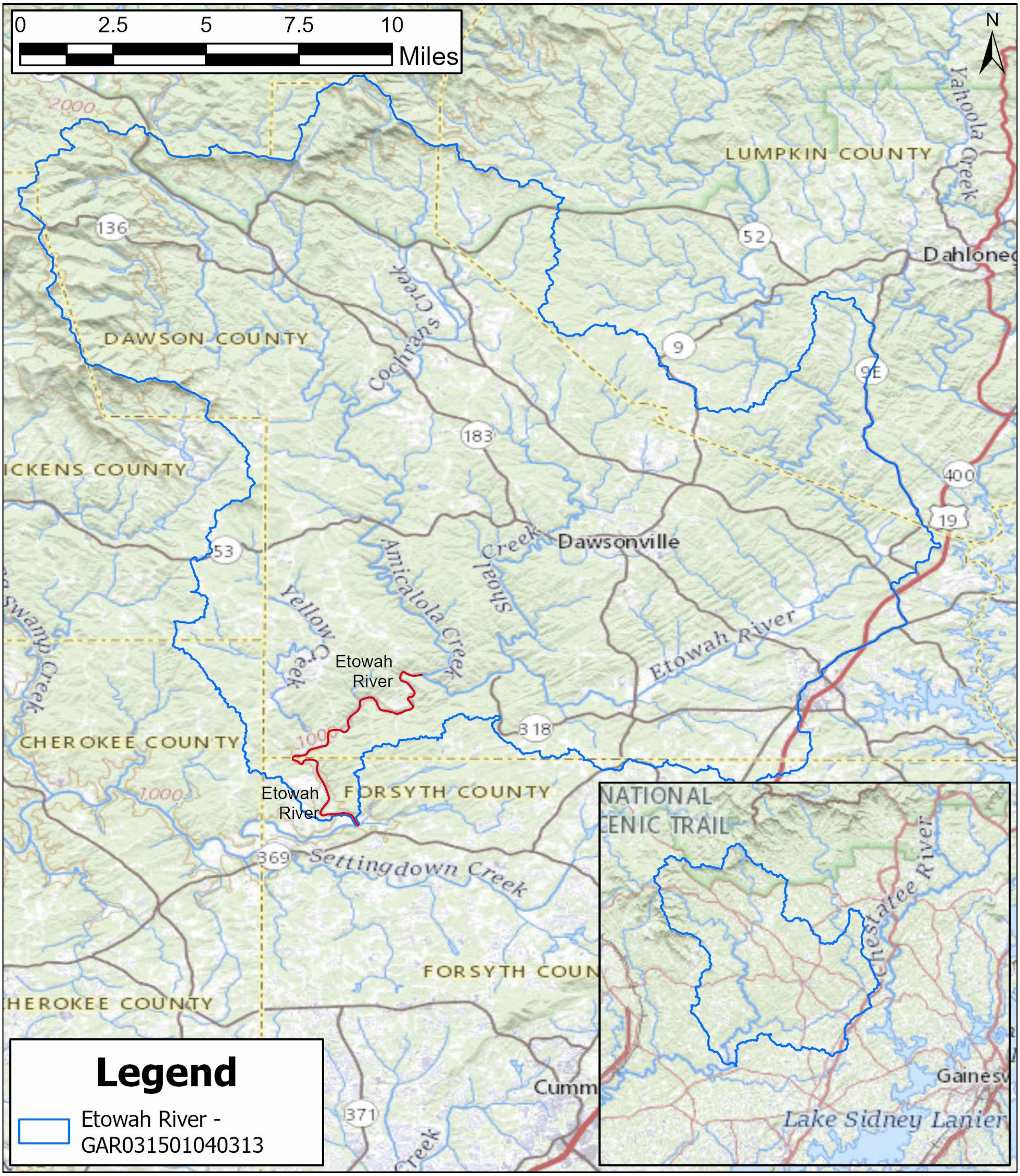

Figure 13: Impaired Stream Segment of Etowah River (GAR031501040313)

Figure 14: Impaired Stream Segments of Euharlee Creek and Simpson Creek

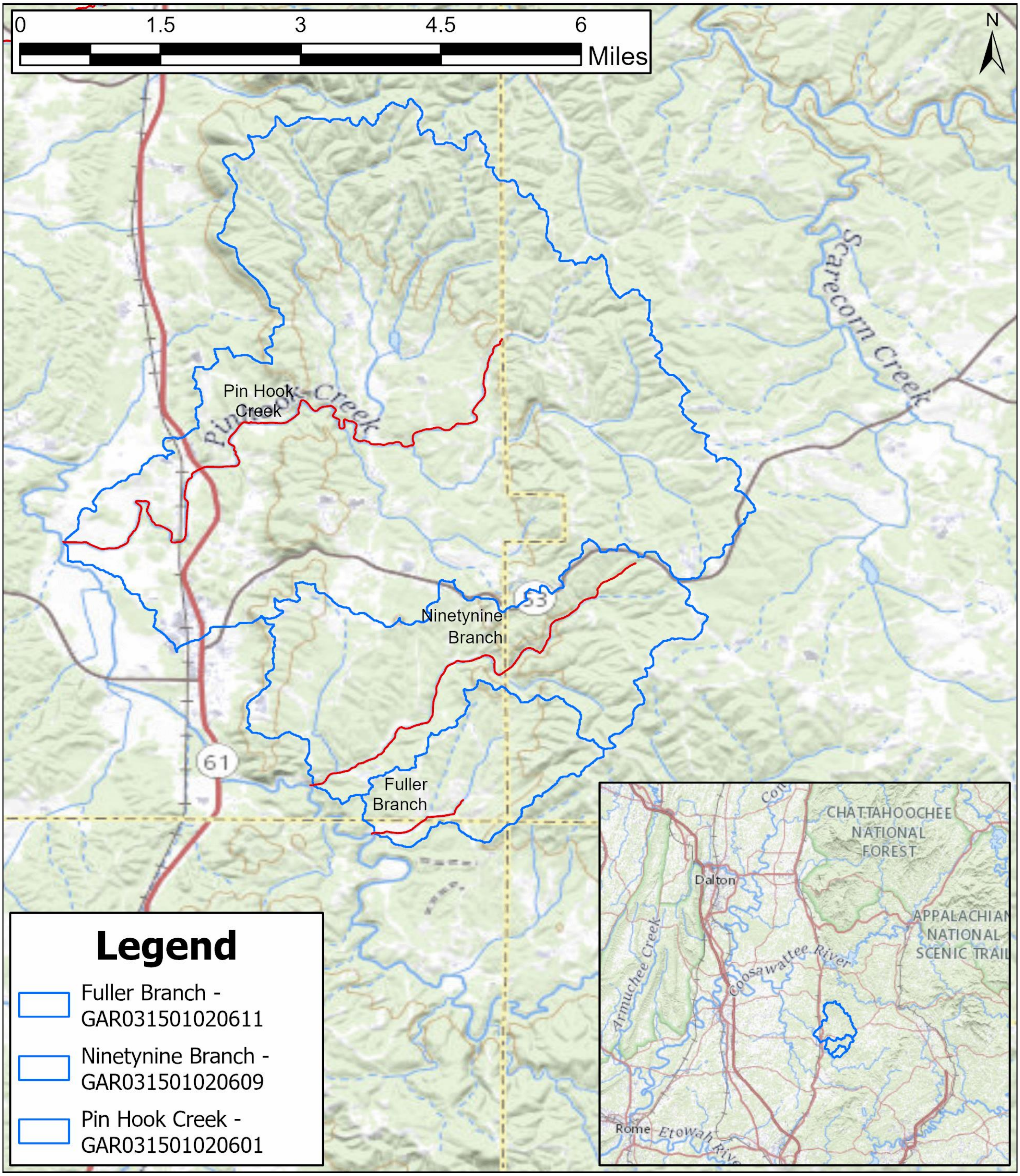

Figure 15: Impaired Stream Segments of Fuller Branch, Ninetynine Branch, and Pin Hook Creek

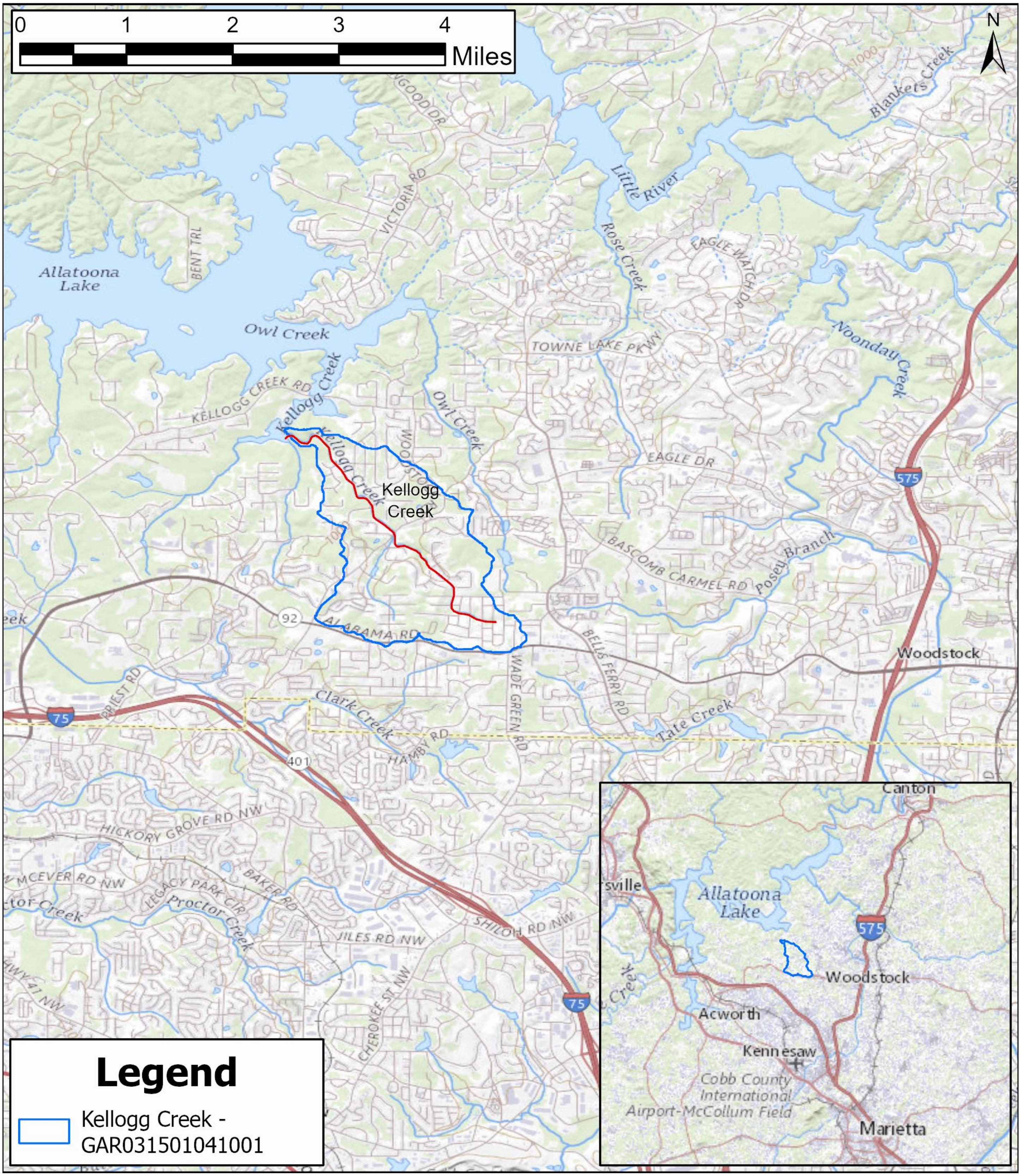

Figure 16: Impaired Stream Segment of Kellogg Creek

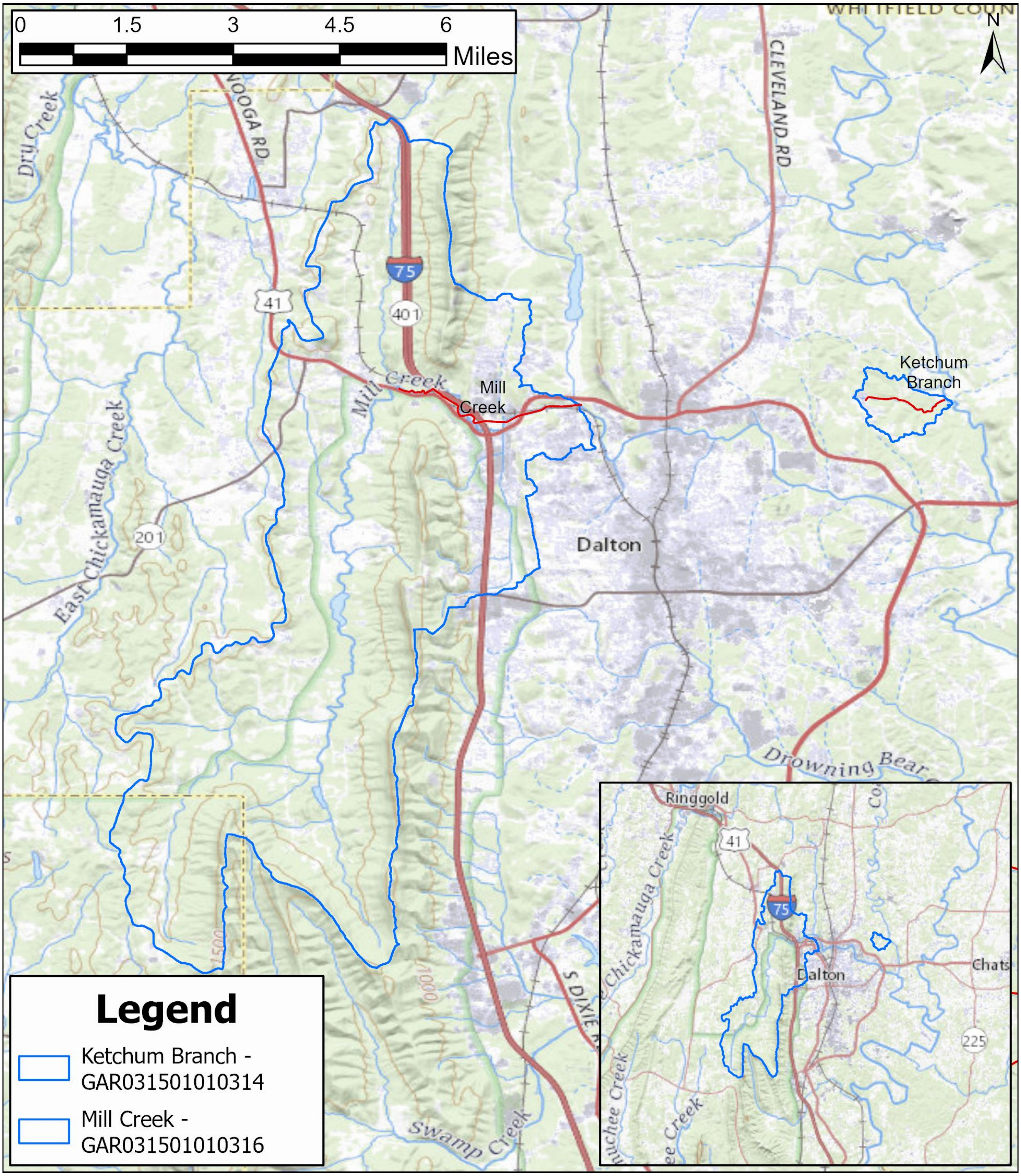

Figure 17: Impaired Stream Segments of Ketchum Branch and Mill Creek

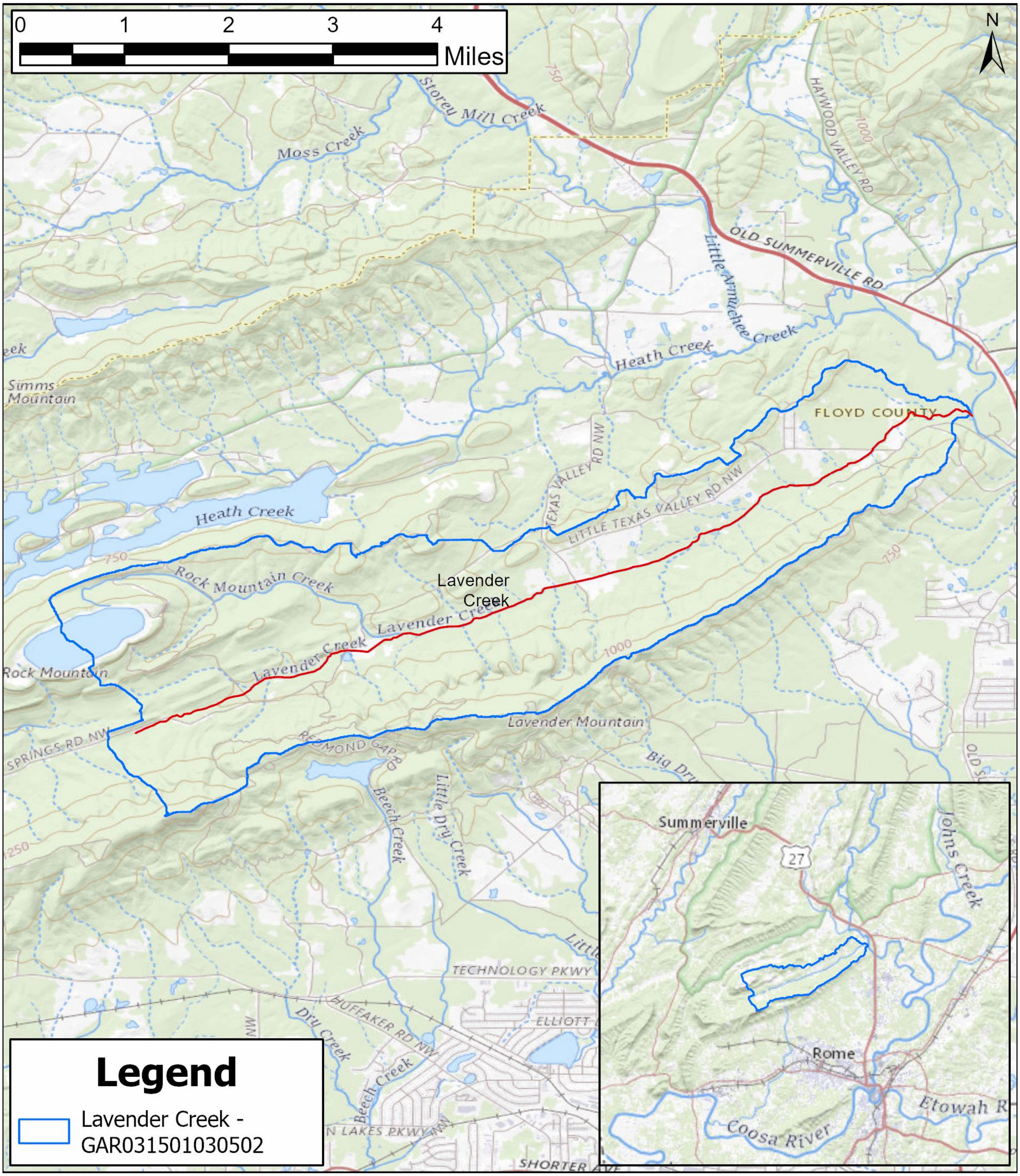

Figure 18: Impaired Stream Segment of Lavender Creek

Figure 19: Impaired Stream Segments of Lick Creek and Redbud Creek

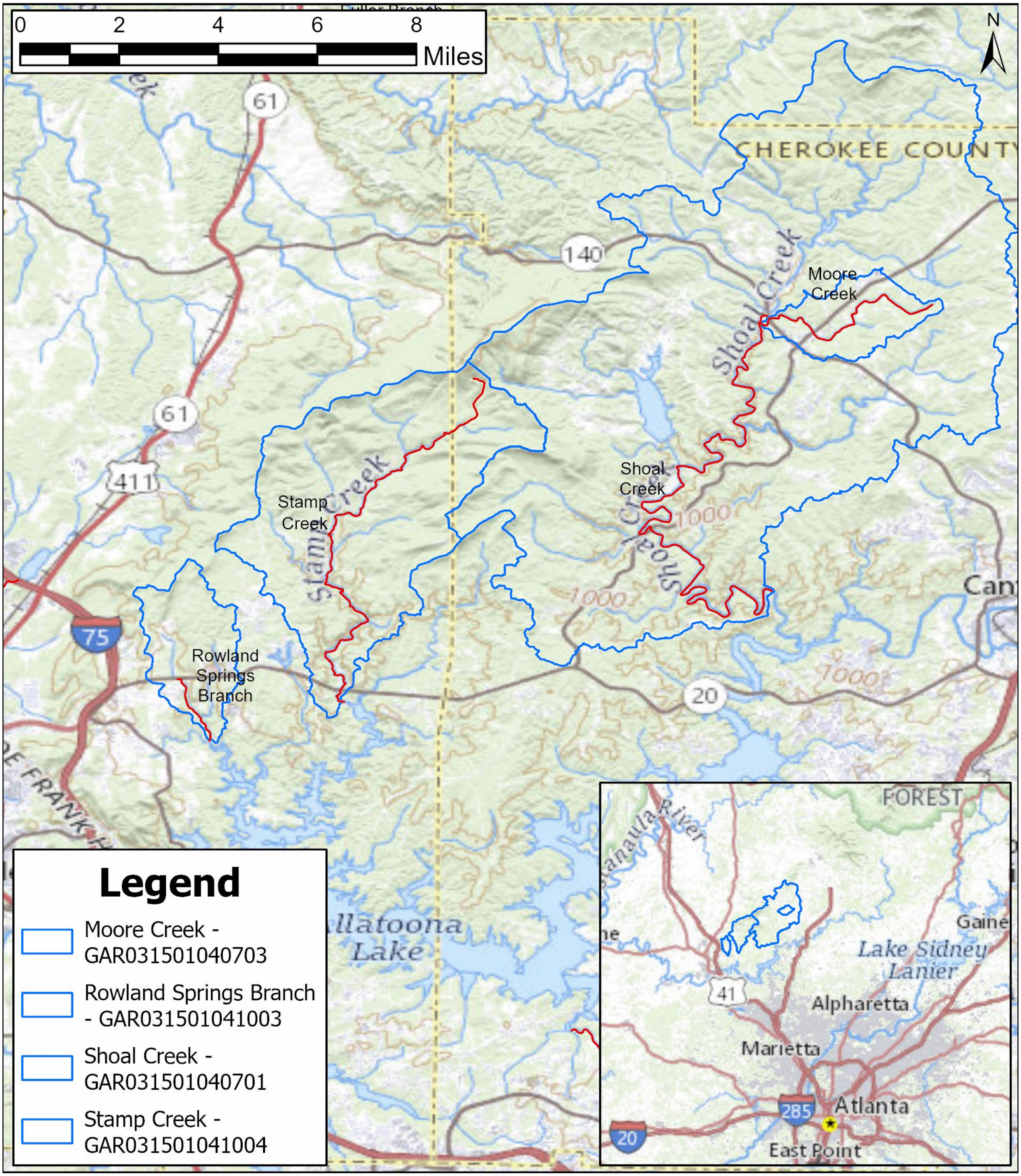

Figure 20: Impaired Stream Segments of Moore Creek, Rowland Springs Branch, Shoal Creek, and Stamp Creek

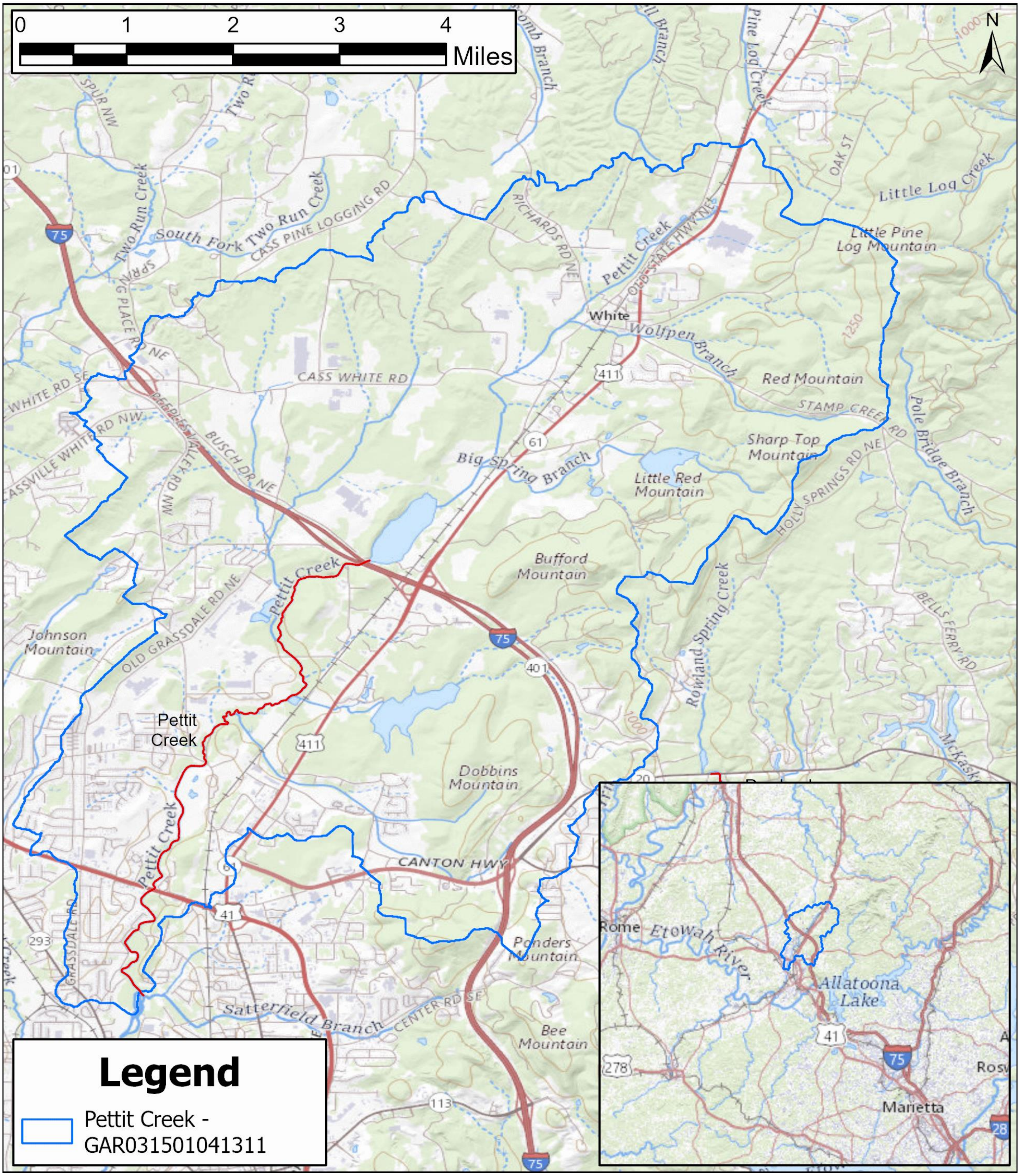

Figure 21: Impaired Stream Segment of Pettit Creek

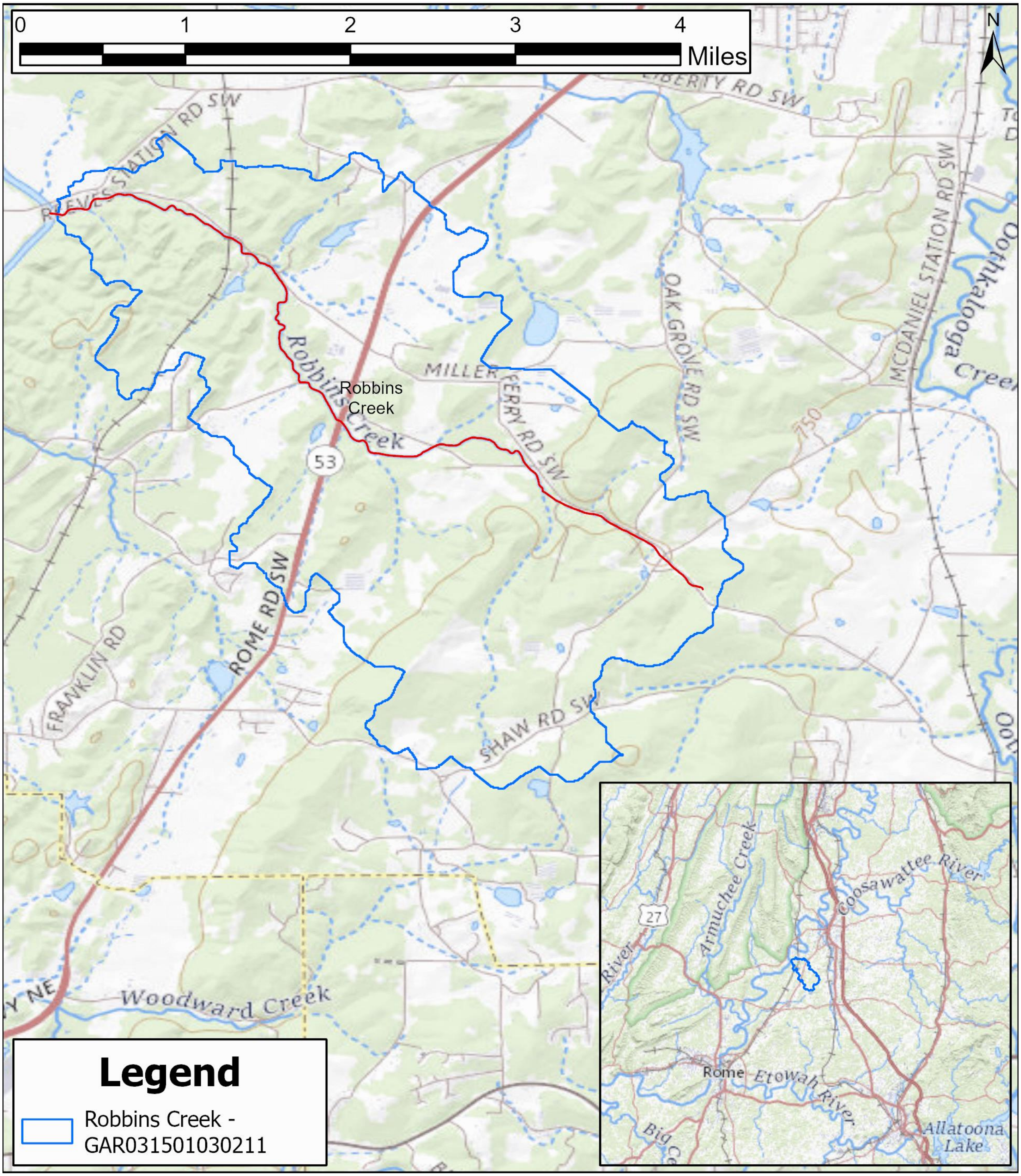

Figure 22: Impaired Stream Segment of Robbins Creek

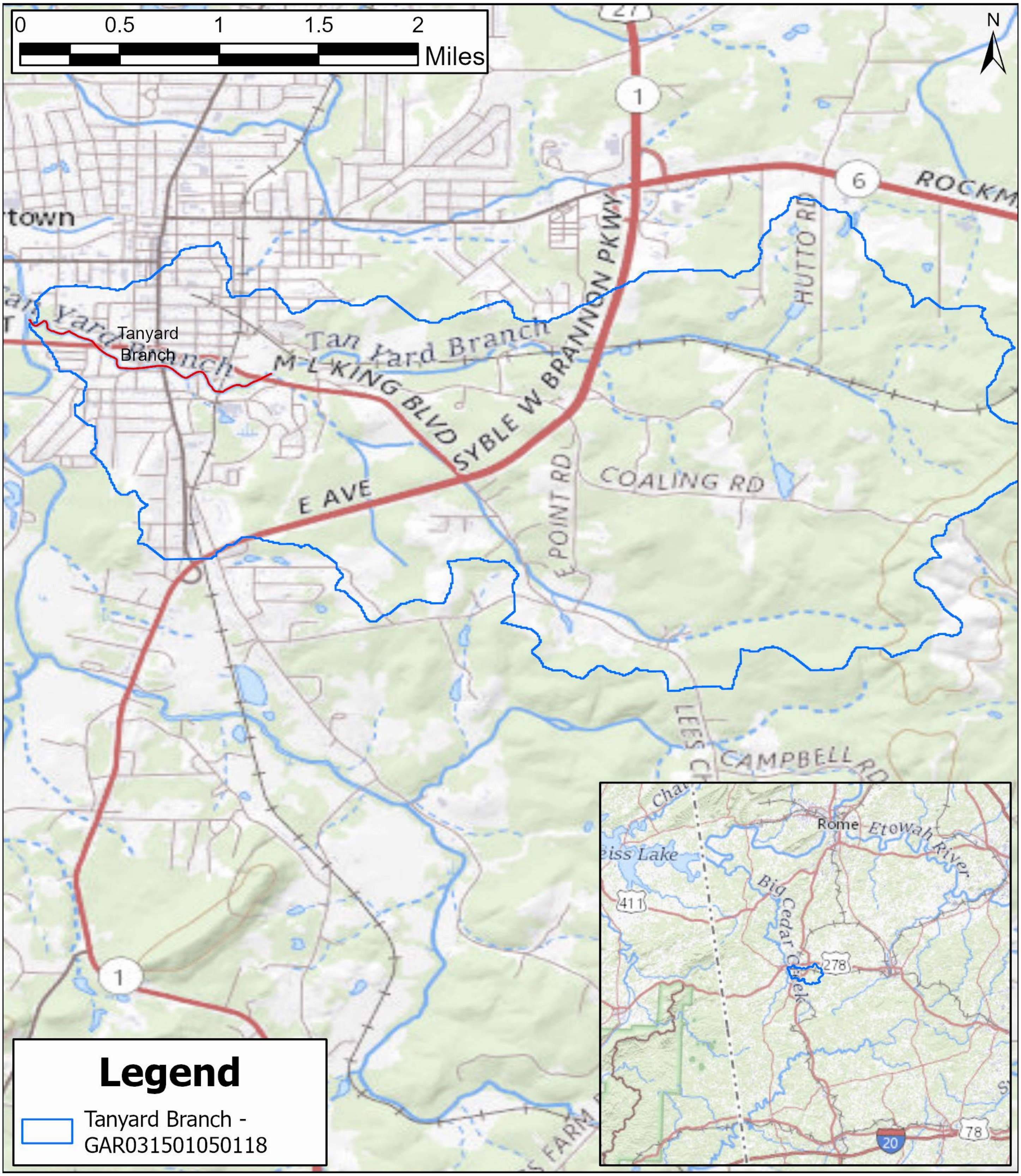

Figure 23: Impaired Stream Segment of Tanyard Branch

In 2011, each RWPC developed and adopted Regional Water Plans, which identify ranges of actions or management practices to help meet the State's water quality challenges. Implementation of these plans is critical in meeting Georgia's water resource challenges. The Coosa-North Georgia RWPC updated their Regional Water Plan in June 2017, which were adopted by GA EPD in July 2017. These Regional Water Plans are available here.

1.4 Water Quality Standard

Every waterbody in the State has one or more designated uses, and each designated use has water quality criteria established to protect it. Waterbodies in Georgia are assessed based on the 305(b)/303(d) Listing Assessment Methodology, as such GA EPD placed twenty-two (22) stream segments in the Coosa River Basin on the 2022 303(d) list of impaired waters because it was assessed as "not supporting" its designated use of "Fishing" due to violations of the fecal coliform criteria. The potential causes listed include urban runoff and nonpoint sources. The fishing bacteria water quality standards as approved by US EPA Region 4 on January 20, 2021, and applicable at the time of listing was as follows:

(c) Fishing: Propagation of Fish, Shellfish, Game and Other Aquatic Life; primary contact recreation in and on the water for the months of May – October, secondary contact recreation in and on the water for the months of November – April; or for any other use requiring water of a lower quality.

(i) Bacteria:

1. For the months of May through October, when water contact recreation activities are expected to occur, fecal coliform not to exceed a geometric mean of 200 counts per 100 mL based on at least four samples collected from a given sampling site over a 30-day period at intervals not less than 24 hours. Should water quality and sanitary studies show fecal coliform levels from non-human sources exceed 200 counts per 100 mL (geometric mean occasionally, then the allowable geometric mean fecal coliform shall not exceed 300 counts per 100 mL in lakes and reservoirs and 500 counts per 100 mL in free flowing freshwater streams. For the months of November through April, fecal coliform not to exceed a geometric mean of 1,000 counts per 100 mL based on at least four samples collected from a given sampling site over a 30-day period at intervals not less than 24 hours and not to exceed a maximum of 4,000 counts per 100 mL for any sample. The State does not encourage swimming in these surface waters since a number of factors which are beyond the control of any State regulatory agency contribute to elevated levels of bacteria.

2. For waters designated as shellfish growing areas by the Georgia DNR Coastal Resources Division, the requirements will be consistent with those established by the State and Federal agencies responsible for the National Shellfish Sanitation Program. The requirements are found in National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish, 2007 Revision (or most recent version), Interstate Shellfish Sanitation Conference, U.S. Food and Drug Administration.

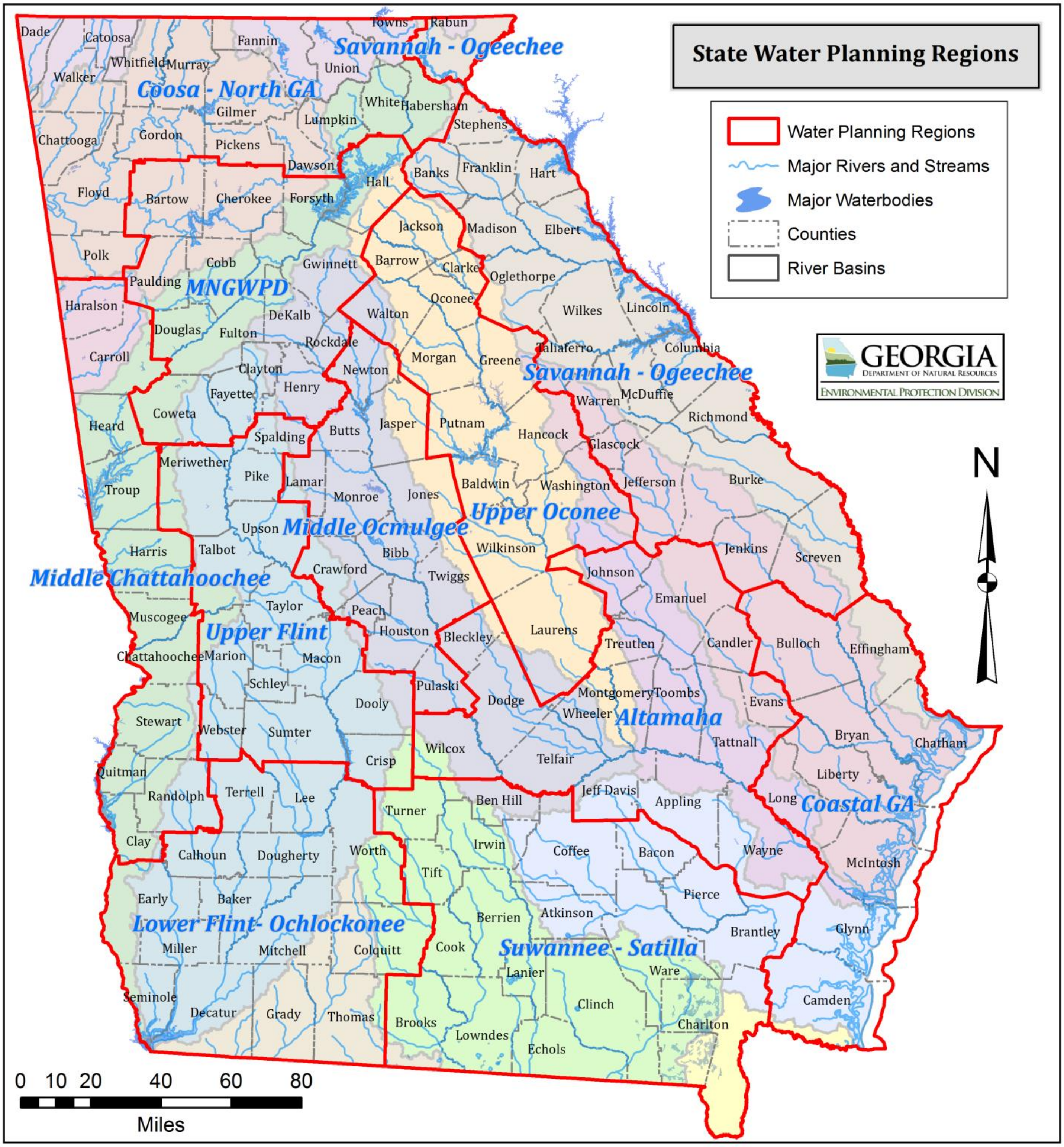

Figure 24: Boundaries of the Regional Water Planning Councils and the Metropolitan North Georgia Water Planning District

In January 2022, the Georgia DNR Board adopted new bacteria criteria for “Fishing” and “Drinking Water” designated uses using the bacterial indicators *E. coli* and enterococci. These bacteria are better indicators for human health illnesses. The adopted criteria have the same estimated illness rate (8 per 1000 swimmers) as the previously established criteria. EPA approved the proposed standards August 31, 2022. Since this TMDL was written after EPA approved the new bacteria criteria, the TMDL will use both bacterial indicators. The use classification water quality standards for fecal coliform bacteria, as stated in the *State of Georgia’s Rules and Regulations for Water Quality Control*, Chapter 391-3-6-.03(6)(c)(iii) (GA EPD, 2022), are:

(c) Fishing: Propagation of Fish, Shellfish, Game and Other Aquatic Life; primary contact recreation in and on the water for the months of May – October, secondary contact recreation in and on the water for the months of November – April; or for any other use requiring water of a lower quality.

(i) Bacteria:

1. Estuarine waters: For the months of May through October, when primary water contact recreation activities are expected to occur, culturable enterococci not to exceed a geometric mean of 35 counts per 100 mL based on at least four samples collected from a given sampling site over a 30-day period at intervals not less than 24 hours. There shall be no greater than a ten percent excursion frequency of an enterococci statistical threshold value (STV) of 130 counts per 100 mL the same 30-day interval.

   For the months of November through April, culturable enterococci not to exceed a geometric mean of 74 counts per 100 mL based on at least four samples collected from a given sampling site over a 30-day period at intervals not less than 24 hours. There shall be no greater than a ten percent excursion frequency of an enterococci statistical threshold value (STV) of 273 counts per 100 mL in the same 30-day interval.

2. All other fishing waters: For the months of May through October, when primary water contact recreation activities are expected to occur, culturable E. coli not to exceed a geometric mean of 126 counts per 100 mL based on at least four samples collected from a given sampling site over a 30-day period at intervals
   not less than 24 hours. There shall be no greater than a ten percent excursion frequency of an E. coli statistical threshold value (STV) of 410 counts per 100 mL in the same 30-day interval.

   For the months of November through April, culturable E. coli not to exceed a geometric mean of 265 counts per 100 mL based on at least four samples collected from a given sampling site over a 30-day period at intervals not less than 24 hours. There shall be no greater than a ten percent excursion frequency of an E. coli statistical threshold value (STV) of 861 counts per 100 mL in the same 30-day interval.

3. The State does not encourage swimming in these surface waters since a number of factors which are beyond the control of any State regulatory agency contribute to elevated levels of bacteria.

4. For waters designated as shellfish growing areas by the Georgia DNR Coastal Resources Division, the requirements will be consistent with those established by the State and Federal agencies responsible for the National Shellfish Sanitation Program. The requirements are found in National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish, 2007 Revision (or most recent version), Interstate Shellfish Sanitation Conference, U.S. Food and Drug Administration.

Table 4: Coosa River Basin Land Coverage

Stream/Segment	Land Use Categories - Acres (Percent)													
	Beaches, Dunes, Mud	Open Water	Developed, Low Intensity	Developed, Medium Intensity	Developed, High Intensity	Transitional, Clearcut, Sparse	Forest	Row Crops	Pasture, Hay	Other Grasses (Developed Open Space, Utility Swaths, Golf Courses)	Forested Wetlands	Non-Forested Wetlands (Salt/Brackish)	Non-Forested Wetlands (Freshwater)	Total
Alpine Creek	0.2	7.3	144.6	30.2	23.1	152.8	2683.9	23.8	2092.1	490.6	55.8	0.0	6.4	5710.9
GAR031501050514	0.0%	0.1%	2.5%	0.5%	0.4%	2.7%	47.0%	0.4%	36.6%	8.6%	1.0%	0.0%	0.1%	100%
Bow Creek	0.4	5.8	57.2	15.1	6.7	130.1	3854.6	61.4	1137.8	153.7	0.7	0.0	0.0	5423.3
GAR031501030207	0.0%	0.1%	1.1%	0.3%	0.1%	2.4%	71.1%	1.1%	21.0%	2.8%	0.0%	0.0%	0.0%	100%
Chappel Creek	0.0	7.1	187.3	64.0	14.5	126.3	4236.8	28.7	1275.4	539.3	0.7	0.0	0.9	6481.0
GAR031501050402	0.0%	0.1%	2.9%	1.0%	0.2%	1.9%	65.4%	0.4%	19.7%	8.3%	0.0%	0.0%	0.0%	100%
Chastain Branch	0.4	20.7	316.9	129.7	35.6	9.8	107.9	0.0	0.9	146.8	1.6	0.0	0.0	770.2
GAR031501040805	0.1%	2.7%	41.1%	16.8%	4.6%	1.3%	14.0%	0.0%	0.1%	19.1%	0.2%	0.0%	0.0%	100%
Conasauga River	36.3	1114.0	12254.0	3978.9	2848.4	10700.1	260210.6	8214.2	71920.1	24452.8	4071.4	3.3	68.3	400177.6
GAR031501010502	0.0%	0.3%	3.1%	1.0%	0.7%	2.7%	65.0%	2.1%	18.0%	6.1%	1.0%	0.0%	0.0%	100%
Conasauga River	41.8	1377.3	15476.5	5782.9	5539.9	11509.2	284688.7	8422.1	75432.6	27825.0	4887.6	3.3	79.0	441371.1
GAR031501010511	0.0%	0.3%	3.5%	1.3%	1.3%	2.6%	64.5%	1.9%	17.1%	6.3%	1.1%	0.0%	0.0%	100%
Cox Creek	0.0	0.0	73.6	18.5	3.3	23.8	556.0	0.0	169.0	219.1	0.0	0.0	0.0	1063.5
GAR031501020202	0.0%	0.0%	6.9%	1.7%	0.3%	2.2%	52.3%	0.0%	15.9%	20.6%	0.0%	0.0%	0.0%	100%
Crane Eater Creek	0.4	20.7	211.1	24.7	16.2	67.4	1475.4	114.3	2364.1	410.3	3.8	0.0	0.0	4708.3
GAR031501020806	0.0%	0.4%	4.5%	0.5%	0.3%	1.4%	31.3%	2.4%	50.2%	8.7%	0.1%	0.0%	0.0%	100%
Dead Mans Branch	0.7	2.2	17.3	4.7	0.9	28.5	368.1	27.4	505.1	69.4	0.4	0.0	0.0	1024.6
GAR031501010513	0.1%	0.2%	1.7%	0.5%	0.1%	2.8%	35.9%	2.7%	49.3%	6.8%	0.0%	0.0%	0.0%	100%

Stream/Segment	Land Use Categories - Acres (Percent)													
	Beaches, Dunes, Mud	Open Water	Developed, Low Intensity	Developed, Medium Intensity	Developed, High Intensity	Transitional, Clearcut, Sparse	Forest	Row Crops	Pasture, Hay	Other Grasses (Developed Open Space, Utility Swaths, Golf Courses)	Forested Wetlands	Non-Forested Wetlands (Salt/Brackish)	Non-Forested Wetlands (Freshwater)	Total
East Armuchee Creek	1.1	40.3	194.4	50.3	19.3	1092.4	21834.7	379.6	3132.9	1050.4	141.2	0.0	0.0	27936.6
GAR031501030512	0.0%	0.1%	0.7%	0.2%	0.1%	3.9%	78.2%	1.4%	11.2%	3.8%	0.5%	0.0%	0.0%	100%
Etowah River	16.7	239.1	2837.8	803.7	364.5	2610.3	149931.4	230.6	10304.4	12822.9	783.5	0.0	9.6	180954.4
GAR031501040312	0.0%	0.1%	1.6%	0.4%	0.2%	1.4%	82.9%	0.1%	5.7%	7.1%	0.4%	0.0%	0.0%	100%
Etowah River	18.2	564.9	3050.8	879.6	381.9	2892.0	159455.2	249.3	11462.0	14288.9	898.7	0.0	10.5	194227.8
GAR031501040313	0.0%	0.3%	1.6%	0.5%	0.2%	1.5%	82.1%	0.1%	5.9%	7.4%	0.5%	0.0%	0.0%	100%
Euharlee Creek	3.3	145.0	1337.7	248.9	120.1	253.5	21354.1	461.2	3064.2	2042.5	49.4	0.0	5.8	29115.1
GAR031501041410	0.0%	0.5%	4.6%	0.9%	0.4%	0.9%	73.3%	1.6%	10.5%	7.0%	0.2%	0.0%	0.0%	100%
Flat Creek	0.9	1.1	42.5	25.4	6.7	132.1	2416.1	13.6	789.7	318.2	5.6	0.0	0.0	3751.8
GAR031501020409	0.0%	0.0%	1.1%	0.7%	0.2%	3.5%	64.4%	0.4%	21.0%	8.5%	0.1%	0.0%	0.0%	100%
Fuller Branch	2.0	4.4	2.4	0.2	0.0	22.9	974.5	0.0	248.0	56.0	0.0	0.0	0.0	1310.6
GAR031501020611	0.2%	0.3%	0.2%	0.0%	0.0%	1.7%	74.4%	0.0%	18.9%	4.3%	0.0%	0.0%	0.0%	100%
Kellogg Creek	0.4	0.0	398.3	65.8	8.9	21.6	434.6	0.0	44.9	365.2	0.0	0.0	0.0	1339.7
GAR031501041001	0.0%	0.0%	29.7%	4.9%	0.7%	1.6%	32.4%	0.0%	3.4%	27.3%	0.0%	0.0%	0.0%	100%
Ketchum Branch	0.2	0.7	12.0	10.2	0.4	21.1	294.0	0.4	40.5	28.9	0.4	0.0	0.0	409.0
GAR031501010314	0.1%	0.2%	2.9%	2.5%	0.1%	5.2%	71.9%	0.1%	9.9%	7.1%	0.1%	0.0%	0.0%	100%
Lavender Creek	0.0	115.2	16.2	0.2	0.0	90.1	6292.7	0.0	426.3	282.0	64.3	0.0	0.0	7369.3
GAR031501030502	0.0%	1.6%	0.2%	0.0%	0.0%	1.2%	85.4%	0.0%	5.8%	3.8%	0.9%	0.0%	0.0%	100%
Lick Creek	5.1	121.9	125.7	32.0	14.7	311.8	8277.3	222.6	2125.9	751.0	71.2	0.0	0.0	12059.1
GAR031501020605	0.0%	1.0%	1.0%	0.3%	0.1%	2.6%	68.6%	1.8%	17.6%	6.2%	0.6%	0.0%	0.0%	100%

Stream/Segment	Land Use Categories - Acres (Percent)													
	Beaches, Dunes, Mud	Open Water	Developed, Low Intensity	Developed, Medium Intensity	Developed, High Intensity	Transitional, Clearcut, Sparse	Forest	Row Crops	Pasture, Hay	Other Grasses (Developed Open Space, Utility Swaths, Golf Courses)	Forested Wetlands	Non-Forested Wetlands (Salt/Brackish)	Non-Forested Wetlands (Freshwater)	Total
Mill Creek	1.1	74.5	1308.3	528.4	249.5	308.0	12276.6	2.9	1502.7	1975.5	121.7	0.0	0.0	18349.4
GAR031501010316	0.0%	0.4%	7.1%	2.9%	1.4%	1.7%	66.9%	0.0%	8.2%	10.8%	0.7%	0.0%	0.0%	100%
Moore Creek	0.0	2.4	61.4	31.6	5.8	29.6	1383.3	0.0	204.2	191.5	13.3	0.0	0.0	1923.0
GAR031501040703	0.0%	0.1%	3.2%	1.6%	0.3%	1.5%	71.9%	0.0%	10.6%	10.0%	0.7%	0.0%	0.0%	100%
Ninetynine Branch	0.0	0.9	47.8	21.3	7.3	43.1	2996.3	0.0	267.5	160.8	6.7	0.0	0.0	3551.9
GAR031501020609	0.0%	0.0%	1.3%	0.6%	0.2%	1.2%	84.4%	0.0%	7.5%	4.5%	0.2%	0.0%	0.0%	100%
Pettit Creek	8.9	246.0	1872.6	976.5	666.7	215.9	11166.7	434.8	2760.6	2012.2	116.5	0.0	1.3	20478.8
GAR031501041311	0.0%	1.2%	9.1%	4.8%	3.3%	1.1%	54.5%	2.1%	13.5%	9.8%	0.6%	0.0%	0.0%	100%
Pin Hook Creek	0.2	14.2	228.2	74.5	41.8	201.3	9391.7	145.0	1857.9	837.5	10.7	0.0	0.0	12803.1
GAR031501020601	0.0%	0.1%	1.8%	0.6%	0.3%	1.6%	73.4%	1.1%	14.5%	6.5%	0.1%	0.0%	0.0%	100%
Redbud Creek	0.0	2.0	26.9	2.2	0.4	93.0	1836.1	2.9	525.3	213.9	5.6	0.0	0.0	2708.3
GAR031501020610	0.0%	0.1%	1.0%	0.1%	0.0%	3.4%	67.8%	0.1%	19.4%	7.9%	0.2%	0.0%	0.0%	100%
Robbins Creek	0.2	12.5	72.3	48.5	20.5	66.1	2506.6	14.7	1257.2	285.1	15.3	0.0	1.6	4300.5
GAR031501030211	0.0%	0.3%	1.7%	1.1%	0.5%	1.5%	58.3%	0.3%	29.2%	6.6%	0.4%	0.0%	0.0%	100%
Rowland Springs Branch	0.0	1.3	118.1	8.0	0.0	68.5	1922.4	0.0	63.4	258.6	33.1	0.0	0.0	2480.4
GAR031501041003	0.0%	0.1%	4.8%	0.3%	0.0%	2.8%	77.5%	0.0%	2.6%	10.4%	1.3%	0.0%	0.0%	100%
Shoal Creek	0.4	433.9	465.9	82.5	13.8	872.2	35287.0	60.7	2446.1	2681.2	98.1	0.0	0.0	42455.2
GAR031501040701	0.0%	1.0%	1.1%	0.2%	0.0%	2.1%	83.1%	0.1%	5.8%	6.3%	0.2%	0.0%	0.0%	100%
Simpson Creek	0.2	6.7	32.9	2.0	0.4	35.1	2184.4	14.2	112.8	91.0	0.2	0.0	0.0	2479.9
GAR031501041407	0.0%	0.3%	1.3%	0.1%	0.0%	1.4%	88.1%	0.6%	4.5%	3.7%	0.0%	0.0%	0.0%	100%

Stream/Segment	Land Use Categories - Acres (Percent)													
	Beaches, Dunes, Mud	Open Water	Developed, Low Intensity	Developed, Medium Intensity	Developed, High Intensity	Transitional, Clearcut, Sparse	Forest	Row Crops	Pasture, Hay	Other Grasses (Developed Open Space, Utility Swaths, Golf Courses)	Forested Wetlands	Non-Forested Wetlands (Salt/Brackish)	Non-Forested Wetlands (Freshwater)	Total
Stamp Creek	0.0	1.6	23.6	0.0	0.0	49.1	11188.5	0.0	93.6	207.0	28.7	0.0	0.0	11592.1
GAR031501041004	0.0%	0.0%	0.2%	0.0%	0.0%	0.4%	96.5%	0.0%	0.8%	1.8%	0.2%	0.0%	0.0%	100%
Tanyard Branch	0.2	5.6	456.6	154.6	71.6	113.0	2422.5	1.8	395.0	372.1	8.7	0.0	1.1	4002.7
GAR031501050118	0.0%	0.1%	11.4%	3.9%	1.8%	2.8%	60.5%	0.0%	9.9%	9.3%	0.2%	0.0%	0.0%	100%
Town Creek	0.9	83.0	427.4	149.7	93.2	213.3	2274.0	5.6	1256.3	582.2	22.2	0.0	0.7	5108.4
GAR031501030212	0.0%	1.6%	8.4%	2.9%	1.8%	4.2%	44.5%	0.1%	24.6%	11.4%	0.4%	0.0%	0.0%	100%

2.0 WATER QUALITY ASSESSMENT

Stream segments are placed on the 303(d) list as not supporting their water use classification based on water quality sampling data. Currently, a stream is placed on this list if more than ten percent of the calculated geometric means exceed their water quality criteria or if more than ten percent of the samples exceed the single sample criteria. Water quality samples collected within a 30-day period that have a fecal coliform geometric mean in excess of 200 counts per 100 milliliters (mL) during the period May through October, or in excess of 1000 counts per 100 mL during the period November through April, are in violation of the bacteria water quality standard. There is also a single sample criterion (4000 counts per 100 mL) not to be exceeded at any given time.

Fecal coliform data used for development of the TMDL in this document were collected during calendar years 2014 through 2021 by GA EPD as part of the trend monitoring program. A summary of sampling station locations and sampling dates is given in Table 5. The raw data are presented in Appendix A. All the streams in which the TMDLs are being revised are currently meeting their water quality standards, and thus the streams are not included in the table below. These streams may have been listed on spill data, and that is no longer available. An alternative method for calculating the TMDL bacterial loading was developed and will be described in later sections with supporting information in Appendix A.

Table 5: Sampling Stations and Dates – Coosa River Basin

Stream Segment	Location	GA EPD Monitoring Station No.	GPS Coordinates	Monitoring Station Description	Sample Date Range
Alpine Creek	Unnamed Tributary at Peach Orchard Road to Stateline	RV_14_4641	34.453, -85.489	Alpine Creek at Oak Hill Alpine Road near Menlo, GA	2021
Bow Creek	Headwaters to Oostanaula River	RV_14_4480	34.53859, -85.02672	Bow Creek at Old Rome Dalton Road NW near Sugar Valley, GA	2018
Crane Eater Creek	Headwaters to Coosawattee River	RV_14_4823	34.531111, -84.872222	Crane Eater Creek at Pine Chapel Road near Calhoun, GA	2018
Dead Mans Branch	Headwaters to Polecat Creek	RV_14_5142	34.587072, -84.889544	Dead Mans Branch at Corinth Road	2019
East Armuchee Creek	Dry Creek to West Armuchee Creek	RV_14_4813	34.605863, -85.115854	Armuchee East Fork Creek near Smith Lane, near LaFayette, GA	2021
Etowah River	Amicalola Creek to Yellow Creek	RV_14_16423	34.35245, -84.20626	Etowah River at Kelly Bridge Road near Silver City, GA	2019
Etowah River	Yellow Creek to Brewton Creek	RV_14_17574	34.313127, -84.230672	Etowah River at Eagles Beak Park near Hightower, GA	2019
Euharlee Creek	Simpson Creek to Tributary 0.2 miles downstream of U.S. 278	RV_14_16353	33.99806, -85.05308	Euharlee Creek at Wayside Park, Rockmart	2016

Stream Segment	Location	GA EPD Monitoring Station No.	GPS Coordinates	Monitoring Station Description	Sample Date Range
Flat Creek	Headwaters to S.R. 382	RV_14_4831	34.639854, -84.574449	Flat Creek at SR 382, near Ellijay, GA	2017
Fuller Branch	Brannon Lake to Salacoa Creek	RV_14_17277	34.41103, -84.67179	Fuller Branch at Riddle Mill Road near Fairmount, GA	2018
Ketchum Branch	Headwaters to Coahula Creek	RV_14_16355	34.801, -84.917	Ketchum Branch at Underwood Road near Dalton, GA	2016
Lick Creek	Redbud Creek to Salacoa Creek	RV_14_4841	34.534829, -84.796003	Lick Creek near Langford Road NE, Fairmount, GA	2017
Mill Creek	North Fork Mill Creek to Haig Mill Creek	RV_14_16360	34.79760, -84.99.376	Mill Creek at SR 3 Bypass	2016
Moore Creek	Headwaters to Shoal Creek	RV_14_17806	34.32878, -84.53471	Moore Creek at Ammons Drive near Waleska, GA	2021
Ninetynine Branch	Headwaters to Salacoa Creek	RV_14_17477	34.42014, -84.67966	Ninetynine Branch at Irwin Mill Road near Fairmount, GA	2017
Pettit Creek	Aubrey Lake to Satterfield Branch	RV_14_5150	34.19866, -84.81178	Pettit Creek at Jones Mill Road	2015
Pin Hook Creek	Pickens Co. Line to Salacoa Creek	RV_14_17810	34.45573, -84.70509	Pinhook Creek at Pinhook Road near Fairmount, GA	2021
Redbud Creek	Headwaters to Defoor Walters Lake	RV_14_17275	34.53364, -84.72860	Redbud Creek at Red Bud Road near Ranger, GA	2018
Robbins Creek	Headwaters to Oostanaula River	RV_14_16794	34.449186, -84.012284	Robins Creek at Miller's Ferry Road at Tressel	2017
Simpson Creek	Headwaters to Hutchings Creek	RV_14_4869	33.960865, -85.061359	Simpson Creek near Jackson Road near Rockmart, GA	2019
Tanyard Branch	Tributary 200 feet upstream of U.S. 278 to Big Cedar Creek/Cedar Creek	RV_14_4777	34.004940, -85.259373	Tanyard Branch at SR 100 / Canal Street	2016
Town Creek	Moss Lake to the Oostanaula River	RV_14_16799	34.528, -84.899	Town Creek at Newton Creek Loop near Calhoun, GA	2017 & 2018

3.0 SOURCE ASSESSMENT

An important part of the TMDL development process is the identification of potential sources of pollutants causing the waterbody to be listed on the 303(d) list. A source assessment identifies the known and suspected sources and discharges of bacteria in the watershed. Sources are broadly classified as either point or nonpoint sources. The CWA defines a point source as any "discernable, confined, and discrete conveyance including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged. This term does not include agricultural stormwater discharges and return flows from irrigated agriculture." Nonpoint sources are diffuse, and generally, but not always, involve accumulation of bacteria on land surfaces that wash off due to storm events.

3.1 Point Source Assessment

Title IV of the CWA establishes the National Pollutant Discharge Elimination System (NPDES) permit program. Basically, there are two categories of NPDES permits: 1) wastewater treatment facilities, and 2) regulated stormwater discharges.

3.1.1 Wastewater Treatment Facilities

In general, NPDES point source discharge permits are issued to Publicly Owned Treatment Works (POTWs) and Non-Publicly Owned Treatment Works (Non-POTWs) authorizing the discharge of treated wastewater to surface waters. POTWs are commonly associated with city and county owned wastewater treatment facilities; whereas Non-POTWs are associated with industrial, private, and federal facilities. The permits include permit conditions, requirements, and numeric effluent limits developed using federal and state effluent guidelines (secondary treatment standards for POTWs and technology-based limits (TBELs) for Non-POTWs) or on water quality standards (water quality-based effluent limits, WQBELs).

The United States Environmental Protection Agency (USEPA) has developed technology-based standards and guidelines, which establish a minimum standard of pollution control for POTW and Non-POTW discharges without regard for the quality of the receiving waters. For POTWs, EPA has established Secondary Treatment Standards. For Non-POTW, the TBELs are based on Best Practical Control Technology Currently Available (BPT), Best Conventional Control Technology (BCT), Best Available Technology Economically Achievable (BAT), and New Source Performance Standards. The level of control required by each facility is dependent on the source of wastewater generated and the pollutants found in the discharge.

The USEPA and the States have also developed numeric and narrative water quality criteria to protect a stream's designated uses. Typically, these criteria are based on the results of aquatic toxicity tests and/or human health criteria and include a margin of safety. Wastewater NPDES permits also include WQBELs to protect these narrative and numeric water quality criteria and their designated uses. WQBELs ensuring water quality standards are met in the receiving water and downstream uses are protected.

For purposes of this TMDL, permitted wastewater treatment facilities are considered point sources, and include POTWs and Non-POTWs. Pollutants discharged from wastewater treatment plants can contribute bacteria to receiving waters. As of 2022, there are thirteen (13) existing

NPDES permitted discharges identified in the watershed of the listed segments in the Coosa River Basin that could potentially impact streams on the 2022 303(d) list for fecal coliform bacteria. There is additionally one proposed discharger that does not affect current water quality conditions but will need to be included in future TMDLs. Typically, the contributing watershed for a 303(d) listed segment is defined as the area upstream of the segment.

Table 6 provides the monthly average discharge flow and fecal coliform concentrations for these facilities that currently have bacteria permit limits. These data were obtained from calendar years 2015 through 2020 Discharge Monitoring Reports (DMR). The current permitted flow and fecal coliform concentrations are also included in this table. Table 7 also provides a list of existing Non-POTW discharges without bacteria permit limits. It is possible these facilities could contribute bacteria to receiving water because the type of treatment processes they employ.

Another potential point source contribution may be a combined sewer system (CSS) that conveys a mixture of raw sewage and stormwater in the same conveyance structure to the wastewater treatment plant and may also have direct discharges (as authorized under a NPDES permit) to waters of the state. These are generally a component of POTWs. When the combined sewage exceeds the capacity of the wastewater treatment plant, the excess is diverted to a combined sewage overflow (CSO) discharge point. There are no permitted CSO outfalls in the Coosa River Basin.

3.1.2 Regulated Stormwater Discharges

Discharges of stormwater authorized under a NPDES permit are considered a point source. Unlike other wastewater NPDES permits that establish end-of-pipe effluent limits, storm water NPDES permits establish best management practices (BMPs) and controls that are intended to reduce the quantity of pollutants that storm water picks up and carries into storm sewer systems during rainfall events “to the maximum extent practicable.” Currently, regulated stormwater discharges that may contain bacteria, consist of those associated with industrial activities and large, medium, and small municipal separate storm sewer systems (MS4s) that serve populations of 10,000 or more.

3.1.2.1 Industrial General Stormwater NPDES Permit

Storm water discharges associated with industrial activities are currently covered under the 2022 NPDES General Permit for Stormwater Discharges Associated with Industrial Activity (GAR050000) also called the Industrial General Permit (IGP). This permit requires visual monitoring of storm water discharges, site inspections, implementation of BMPs, preparation of a Storm Water Pollution Prevention Plan (SWPPP), and annual reporting. The IGP requires that stormwater discharging into an impaired stream segment or within one linear mile upstream of, and within the same watershed as, any portion of an impaired stream segment identified as “not supporting” its designated use(s), must satisfy the requirements of Appendix C of the 2022 IGP, if the pollutant(s) of concern for which the impaired stream segment has been listed may be exposed to stormwater as a result of industrial activity at the site. If a facility is covered under Appendix C of the IGP, then benchmark monitoring for the pollutant(s) of concern is required. Delineations of both supporting and not supporting waterbodies are provided on the GA EPD website, and are available in ESRI ArcGIS shapefile format or in KMZ format for use in Google Earth. Interested parties may evaluate their proximity to not supporting waterbodies by utilizing these geospatial files.
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Table 6: NPDES Facilities Discharging Fecal Coliform in the Coosa River Basin

Facility Name	NPDES Permit No.	Receiving Stream	303(d) Listed Segment(s)	Actual Discharge (2015–2020)		NPDES Permit Limits		Number of Spills[c]
				Avg. Monthly Flow (MGD)[a]	Avg. Monthly fecal coliform (#/100mL)[b]	Avg. Monthly Flow (MGD)	Avg. Monthly fecal coliform (#/100mL)	
America's Best Value Inn & Suites WPCP	GA0048887	Little Swamp Creek	Conasauga River GAR031501010511	0.0154 (0.0-0.024)	2.1 (0.0-19.0)	0.025	200	0
Cohutta Springs Conference Center WPCP	GAG550118	Sumac Creek	Conasauga River GAR031501010502 Conasauga River GAR031501010511	0.0051 (0.0-0.026)	5.9 (0.0-200)	0.039	200	0
Dawnville Elementary School WPCP	GA0034002	Tributary to Moody Branch	Conasauga River GAR031501010502 Conasauga River GAR031501010511	0.0053 (0.0-0.011)	0.6 (0.0-24.0)	0.012	200	0
Dawson Forest WRF[d] (Etowah Water & Sewer Authority)	GA0050319	Etowah River	Etowah River GAR031501040312 Etowah River GAR031501040313	N/A	N/A	2.5	200	N/A
Fairmount WPCP	GA0046388	Salacoa Creek	Pin Hook Creek GAR031501020601	0.0235 (0.0-0.101)	64.2 (0.0-4160)	0.2	200	0
Judson Vick WPCP (Chatsworth Water Works)	GA0032492	Holly Creek	Conasauga River GAR031501010502 Conasauga River GAR031501010511	1.60 (0.64-3.72)	10.5 (1.0-44.0)	3	200	0
Menlo WPCP	GA0047023	Alpine Creek	Alpine Creek GAR031501050514	0.0188 (0.0-0.81)	0.3 (0.0-9.2)	0.099	200	0
Mill Creek WPCP[e] (Chatsworth Water Works)	GA0050281	Mill Creek (Murray Co.)	Conasauga River GAR031501010502 Conasauga River GAR031501010511	N/A	N/A	1	200	0

Facility Name	NPDES Permit No.	Receiving Stream	303(d) Listed Segment(s)	Actual Discharge (2015–2020)		NPDES Permit Limits		Number of Spills[c]
				Avg. Monthly Flow (MGD)[a]	Avg. Monthly fecal coliform (#/100mL)[b]	Avg. Monthly Flow (MGD)	Avg. Monthly fecal coliform (#/100mL)	
Mill Creek WPCP (Dalton Utilities)	GA0038946	Mill Creek (Whitfield Co.)	Conasauga River GAR031501010502 Conasauga River GAR031501010511 Mill Creek GAR031501010316	0.0429 (0.0-0.1)	0.9 (0.0-3.0)	0.15	200	4
Mountainbrook Center WPCP	GA0034959	Tributary to Moore Creek	Moore Creek GAR031501040703 Shoal Creek GAR031501040701	N/A	N/A	0.006	200	0
Rockmart WPCP	GA0025607	Tributary to Euharlee Creek	Euharlee Creek GAR031501041410	3.49 (1.09-5.44)	5.3 (1.0-26.0)	3	200	5
Whispering Pines Mobile Home Park WPCP	GA0023426	Ketchum Creek	Conasauga River GAR031501010502 Conasauga River GAR031501010511 Ketchum Branch GAR031501010314	0.0231 (0.0-0.036)	16.7 (0.0-470.0)	0.038	200	0
Whitfield Mountain View Acres WPCP (Dalton Utilities)	GA0047848	Stone Branch	Conasauga River GAR031501010502 Conasauga River GAR031501010511	0.0464 (0.0-0.081)	5.0 (0.0-84.0)	0.084	200	1
W.L. Swain Elementary School WPCP	GAG550058	Robbins Creek	Robbins Creek GAR031501030211	0.00004 (0.0-0.0001)	0.4 (0.0-26.0)	0.0099	200	0

Source: GA EPD – Discharge Monitoring Report (DMR data from ICIS-NPDES)

Notes: [a] - Values shown are the average of the monthly average flows reported in DMRs, followed by the monthly average ranges during the period.
[b] - Values shown are the annual average of the monthly geometric means and the monthly average ranges.
[c] - 2015-2020; From GAPDES self-reported spill monitoring system.
[d] - Unissued draft permit, no permit limits or DMR data available
[e] - Facility did not receive authorization to operate until September 2022

Table 7: NPDES Non-POTW Facilities without Bacteria Permit Limits that Discharge to 303(d) Listed Stream Segments in the Coosa River Basin

Facility Name	NPDES Permit No.	Receiving Stream	303(d) Listed Segment(s)
Rockmart Slate Corp.	GA0001929	Simpson Creek	Euharlee Creek GAR031501041410
Vulcan Construction Materials – Dalton Quarry	GAG300069	Tributary to Coahulla Creek	Conasauga River GAR031501010502 Conasauga River GAR031501010511

3.1.2.2 MS4 NPDES Permits

The collection, conveyance, and discharge of diffuse storm water to local waterbodies by a public entity are regulated in Georgia by the NPDES MS4 permits. These MS4 permits have been issued under two phases. Phase I MS4 permits cover medium and large cities, and counties with populations over 100,000. Each individual Phase I MS4 permit requires the prohibition of non-storm water discharges (i.e., illicit discharges) into the storm sewer systems and controls to reduce the discharge of pollutants to the maximum extent practicable, including the use of management practices, control techniques and systems, as well as design and engineering methods (Federal Register), 1990. A site-specific Storm Water Management Plan (SWMP) outlining appropriate controls is required by and referenced in the permit. A program to monitor and control pollutants in storm water discharges from industrial facilities, construction sites, and highly visible pollutant sources that exist within the MS4 area must be implemented under the permit. Additionally, monitoring of not supporting streams, public education and involvement, post-construction storm water controls, low impact development, and annual reporting requirements must all be addressed by the permittee on an ongoing basis. As of 2022, fifty-seven (57) counties and municipalities are covered by Phase I MS4 permits in Georgia.

Small MS4s serving urbanized areas are required to obtain a storm water permit under the Phase II storm water regulations. An urbanized area is defined as an area with a residential population of at least 10,000 people and an overall population density of at least 1,000 people per square mile. As of 2022, Seventy-three (73) municipalities, thirty-five (35) counties, five (5) Department of Defense facilities, and the Georgia Department of Transportation (GDOT) are permitted under the Phase II storm water regulations in Georgia. All municipal Phase II permittees are authorized to discharge under Storm Water General Permit GAG610000. Department of Defense facilities are authorized to discharge under Storm Water General Permit GAG480000. GDOT owned or operated facilities are authorized to discharge under Storm Water General Permit GAR041000.

Under these general permits, each permittee must design and implement a SWMP that incorporates BMPs that focus on public education and involvement, illicit discharge detection and elimination, construction site runoff control, post-construction storm water management, and pollution prevention in municipal operations. Urbanized areas include land uses identified as lawns, parks, and greenspace, as well as residential, commercial, industrial, and transportation facilities. Table 8 provides the Phase I and Phase II counties or communities covered by MS4s Permits in the Coosa River Basin. There are fifteen (15) permitted MS4s that discharge into or upstream of a stream segment not supporting its designated use for bacteria.

Table 8: Permitted MS4s in the Coosa River Basin

Permit No.	MS4 Permittee	MS4 Phase	Impaired Stream Watershed
GAS000300	Forsyth County	Phase 1 Medium	Etowah River GAR031501040313 Etowah River GAR031501040312
GAS000108	Cobb County	Phase 1 Large	Chastain Branch GAR031501040805
GAG610000	Bartow County	Phase 2	Fuller Branch GAR031501020611 Pettit Creek GAR031501041311 Rowland Springs Branch GAR031501041003 Shoal Creek GAR031501040701 Stamp Creek GAR031501041004
GAG610000	Cherokee County	Phase 2	Etowah River GAR031501040313 Fuller Branch GAR031501020611 Kellogg Creek GAR031501041001 Moore Creek GAR031501040703 Shoal Creek GAR031501040701 Stamp Creek GAR031501041004
GAG610000	Dawson County	Phase 2	Etowah River GAR031501040312 Etowah River GAR031501040313
GAG610000	Floyd County	Phase 2	Bow Creek GAR031501030207 East Armuchee Creek GAR031501030512 Lavender Creek GAR031501030502
GAG610000	Murray County	Phase 2	Conasauga River GAR031501010502 Conasauga River GAR031501010511
GAG610000	Paulding County	Phase 2	Euharlee Creek GAR031501041410 Simpson Creek GAR031501041407

Permit No.	MS4 Permittee	MS4 Phase	Impaired Stream Watershed
GAG610000	Walker County	Phase 2	Chappel Creek GAR031501050402 Conasauga River GAR031501010502 Conasauga River GAR031501010511 East Armuchee Creek GAR031501030512 Mill Creek GAR031501010316
GAG610000	Whitfield County	Phase 2	Conasauga River GAR031501010502 Conasauga River GAR031501010511 East Armuchee Creek GAR031501030512 Ketchum Creek GAR031501010314 Mill Creek GAR031501010316
GAG610000	City of Cartersville	Phase 2	Pettit Creek GAR031501041311
GAG610000	City of Chatsworth	Phase 2	Conasauga River GAR031501010502 Conasauga River GAR031501010511
GAG610000	City of Dalton	Phase 2	Conasauga River GAR031501010502 Conasauga River GAR031501010511 Ketchum Creek GAR031501010314 Mill Creek GAR031501010316
GAG610000	City of Eton	Phase 2	Conasauga River GAR031501010502 Conasauga River GAR031501010511
GAG610000	City of Varnell	Phase 2	Conasauga River GAR031501010502 Conasauga River GAR031501010511

Source: Nonpoint Source Program, GA DNR, 2022

Table 9: Urban Land Use Percentage for Listed Segments with MS4 Permit Contributions

Stream Segment	Location	Reach AUID	Total Watershed Area (acres)	Urban Land Use Percentage
Chastain Branch	Tributary to Noonday Creek	GAR031501040805	770.2	81.95%
Conasauga River	Hwy 286 to Holly Creek	GAR031501010502	400177.6	4.02%
Conasauga River	Holly Creek to Thomason Creek	GAR031501010511	441371.1	5.31%
Etowah River	Amicalola Creek to Yellow Creek	GAR031501040312	180954.4	0.82%
Etowah River	Yellow Creek to Brewton Creek	GAR031501040313	194227.8	0.76%
Kellogg Creek	Lake Allatoona Tributary	GAR031501041001	1339.7	62.62%
Ketchum Branch	Headwaters to Coahula Creek	GAR031501010314	409.0	7.52%
Mill Creek	North Fork Mill Creek to Haig Mill Creek	GAR031501010316	18349.4	14.41%
Pettit Creek	Aubrey Lake to Satterfield Branch	GAR031501041311	20478.8	14.31%
Rowland Springs Branch	Lake Allatoona Tributary	GAR031501041003	2480.4	6.90%
Shoal Creek	Hwy 140 to Lake Allatoona	GAR031501040701	42455.2	0.002%
Stamp Creek	Headwaters to Lake Allatoona	GAR031501041004	2479.9	0.02%

3.1.3 Concentrated Animal Feeding Operations

Animal feeding operations (AFOs) are agricultural operations where animals are kept and raised in confined situations. AFOs that meet the regulatory definition of a concentrated animal feeding operation (CAFO) are regulated under the NPDES permitting program. The NPDES program regulates the discharge of pollutants from point sources to waters of the state. From 1999 through 2001, Georgia adopted rules for permitting swine and non-swine liquid manure animal feeding operations (AFOs). Georgia rules required medium size AFOs with more than 300 animal units (AU), but less than 1,000 AU, to apply for a non-discharge state land application system (LAS) waste disposal permit. Large operations with more than 1000 AU were required to apply for an NPDES permit (also non-discharge) as a CAFO. The USEPA CAFO regulations were successfully appealed in 2005. They were revised to comply with the court's decision that NPDES permits only be required for actual discharges. Georgia's rules were amended on August 7, 2012, to reflect the USEPA revisions. The revised state rules authorize LAS permitting of medium and large size liquid manure AFOs unless they elect to obtain an NPDES permit. There are no known liquid manure CAFO located in the watersheds of the listed segments in the Coosa River Basin that have NPDES or land application permits. There is one known liquid manure CAFO located in the watersheds of the listed segments that was previously permitted under Georgia rules that no longer meets the size that is required for permit coverage.

In 2002, the USEPA promulgated expanded NPDES permit regulations for CAFOs that added dry manure poultry operations larger than 125,000 broilers or 82,000 layers. In accordance with the Georgia rule amendment discussed above, the general permit covering these facilities has been terminated and they are no longer covered under any permit. Georgia is consistently among the top three states in the U.S. in terms of poultry operations. Most poultry farms are dry manure operations where the manure is stored for a time and then land applied. Freshly stored litter can be a nonpoint source of bacteria. However, land-applied litter previously stored for an extended length of time typically exhibits very low bacteria levels. Table 10 presents the current swine and non-swine (primarily dairies) CAFOs located in the Coosa River Basin and indicates those that may impact the listed streams**.**

Table 10: Permitted CAFOs in the Coosa River Basin

Name	Permit No.	County	Animal Type	Total No. of Animals Units	Impaired Stream Watershed
Harrison Dairy	GAG920041	Murray	Dairy	300 to 1000	Conasauga River GAR031501010502 Conasauga River GAR031501010511

Source: Georgia Pollutant Discharge Elimination System, GA EPD, 2022

3.2 Nonpoint Source Assessment

In general, nonpoint sources cannot be identified as entering a waterbody through a discrete conveyance at a single location. Typical nonpoint sources of bacteria include:

- Wildlife
- Agricultural Livestock
  - Animal grazing
  - Animal access to streams
  - Application of manure to pastureland and cropland
- Urban Development
  - Leaking sanitary sewer lines
  - Leaking septic systems
  - Land Application Systems
  - Landfills

In urban areas, a large portion of stormwater runoff may be collected in storm sewer systems and discharged through distinct outlet structures. For large urban areas, these storm sewer discharge points may be regulated as described in Section 3.1.2.

3.2.1 Wildlife

The significance of wildlife as a source of bacteria in streams varies considerably depending on the animal species present in the watershed. Based on information provided by the Wildlife Resources Division (WRD) of GA DNR, the greatest wildlife sources of bacteria are the animals that spend a large portion of their time in or around aquatic habitats. Of these, waterfowl, especially ducks and geese, are considered to be the most significant source, because when present, they are typically found in large numbers on the water surface. Other animals regularly found around aquatic environments include racoons, beavers, muskrats, and to a lesser extent, river otters and minks. Recently, rapidly expanding feral swine populations have become a substantial presence in the floodplain areas of the major rivers in Georgia.

White-tailed deer populations are also abundant throughout the Coosa River Basin. Bacteria contributions to waterbodies from deer are generally considered to be less significant than that of waterfowl, racoons, and beavers. This is because a greater portion of their time is spent in terrestrial habitats. This also holds true for other terrestrial mammals such as squirrels and rabbits, and for terrestrial birds (GA WRD, 2007). However, feces deposited on the land surface can result in the introduction of bacteria to streams during runoff events. Between storm events, considerable decomposition of the fecal matter might occur, resulting in a decrease in the associated bacteria numbers.

3.2.2 Agricultural Livestock

Agricultural livestock are a potential source of bacteria to streams in the Coosa River Basin. The animals grazing on pastureland deposit their feces onto land surfaces, where it can then be transported during storm events to nearby streams. Animal access to pastureland varies monthly, resulting in varying bacteria loading rates throughout the year. Beef cattle spend all their time in pastures, while dairy cattle and hogs are periodically confined. In addition, agricultural livestock will often have direct access to streams that pass through their pastures and can thus impact water quality in a more direct manner (USDA, 2002).

Commercial chickens are raised indoors, and their litter is periodically disposed of. The litter can be aged or composted. This results in a decomposition of the litter into a soil amendment that can be used as a fertilizer. The stockpiled manure should be kept in a sheltered area. Proper composting should generate temperatures of 140ºF to 160ºF, which destroys bacteria. Aging the manure and litter reduces populations of microbes by providing unfavorable growing conditions causing the bacteria to gradually die off due to changes in moisture content and temperature. Table 11 provides the estimated number of beef cattle, dairy cattle, goats, horses, swine, sheep, and chickens reported by county.

Table 11: Estimated Agricultural Livestock Populations in Counties Containing the 303(d) Listed Segment Watershed in the Coosa River Basin

County	Livestock								
	Beef Cattle	Dairy Cattle	Swine	Sheep	Horses	Goats	Chickens		
							Broilers	Layers	Pullets
Bartow	16,610	-	60	277	700	740	16,155,429	91,490	32,035
Chattooga	14,298	-	-	-	450	300	6,837,110	255,947	74,592
Cherokee	4,140	-	-	-	2,700	-	1,237,056	32,230	61,472
Cobb	371	25	-	-	298	-	-	-	-
Dade	5,062	-	50	80	400	650	2,849,706	55,569	10,656
Dawson	2,893	42	70	300	675	165	16,343,226	-	101,898
Fannin	3,827	-	150	50	600	600	2,645,531	101,327	16,650
Floyd	10,681	38	3,418	750	275	1,500	9,834,214	-	14,119

County	Livestock								
	Beef Cattle	Dairy Cattle	Swine	Sheep	Horses	Goats	Chickens		
							Broilers	Layers	Pullets
Forsyth	3,261	-	120	80	1,045	126	5,662,289	49,880	58,608
Fulton	1,489	-	20	250	2,286	450	-	-	-
Gilmer	8,762	-	95	50	480	150	37,092,576	375,288	449,217
Gordon	10,746	-	160	250	1,550	1,201	67,644,478	284,975	132,134
Haralson	8,300	-	-	200	450	400	8,260,871	43,000	33,300
Lumpkin	2,894	9	8	177	250	170	8,407,723	88,778	65,268
Murray	5,231	1,000	-	100	1,100	500	31,101,753	437,141	217,316
Paulding	2,197	-	100	100	525	550	2,290,137	-	-
Pickens	3,871	-	15	10	500	45	11,131,867	64,698	89,910
Polk	5,019	28	50	550	450	1,250	2,838,787	-	32,967
Walker	20,967	150	-	450	700	1,401	17,454,720	202,548	123,743
Whitfield	5,858	40	-	45	29	300	8,634,280	215,991	16,117

Source: Center for Agribusiness and Economic Development, UGA 2022

3.2.3 Urban Development

Bacteria from urban areas are attributable to multiple sources, including: domestic animals, leaks and overflows from sanitary sewer systems, illicit discharges, leaking septic systems, runoff from improper disposal of waste materials, and leachate from both operational and closed landfills.

Urban runoff can contain high concentrations of bacteria from domestic animals and urban wildlife. Bacteria enter streams by direct wash off from the land surface, or the runoff may be diverted to a stormwater collection system and discharged through a discrete outlet structure. For large, medium, and small urban areas (populations greater than 10,000), the stormwater outlets are regulated under MS4 permits (see Section 3.1.2). For smaller urban areas, the stormwater discharge outlets currently remain unregulated.

In addition to urban animal sources of bacteria, there may be illicit connections to the storm sewer system. As part of the MS4 permitting program, municipalities are required to conduct dry-weather monitoring to identify and then eliminate these illicit discharges, but this may not occur in unpermitted storm sewer systems. Bacteria may also enter streams from leaky sewer pipes, or during storm events when inflow and infiltration can cause sewer overflows.

3.2.3.1 Leaking Septic Systems

A portion of the bacteria contributions in the Coosa River Basin may be attributed to failure of septic systems and illicit discharges of raw sewage. Table 12 below presents the number of septic systems existing at the end of 2015 and the number existing at the end of 2020in counties in the Coosa River Basin. These data are based on data provided by the Georgia Department of Public Health and information obtained from the U.S. Census. In addition, an estimate of the number of septic systems installed and repaired during the period from 2015 through 2020 is given. These data show an increase in the number of septic systems in all counties. Often, this reflects population increases outpacing the expansion of sewage collection systems.

Table 12: Estimated Number of Septic Systems in Counties within the Coosa River Basin

County	Existing Septic Systems (2015)	Existing Septic Systems (2020)	Number of Septic Systems Installed (2015 to 2020)	Number of Septic Systems Repaired (2015 to 2020)
Bartow	23,190	24,056	866	884
Chattooga	7,762	7,995	233	245
Cherokee	39,470	41,118	1,648	947
Cobb	34,361	34,738	377	2,074
Dade	6,041	6,250	209	136
Dawson	9,587	10,083	496	254
Fannin	18,015	19,552	1,537	176
Floyd	16,371	16,621	250	517
Forsyth	33,349	34,513	1,164	1,999
Fulton	28,168	28,992	824	628
Gilmer	17,971	19,135	1,164	310
Gordon	17,131	17,610	479	577
Haralson	8,784	9,153	369	209
Lumpkin	12,632	13,545	913	208
Murray	13,078	13,392	314	241
Paulding	39,452	40,883	1,431	1,999
Pickens	12,799	13,573	774	229
Polk	11,497	11,789	292	424
Walker	20,972	21,445	473	537
Whitfield	22,941	23,538	597	476

Source: The Georgia Dept. of Public Health, Environmental Health Section, 2022

3.2.3.2 Land Application Systems

Some communities and industries use land treatment systems for wastewater disposal. These facilities are required through land application system (LAS) permits to dispose of their treated wastewater by land application, and to operate as non-discharging systems that do not contribute wastewater effluent runoff to surface waters. However, sometimes the soil's percolation rate is exceeded when applying the wastewater, or encountering excess precipitation, resulting in runoff. This runoff could contribute bacteria to nearby surface waters. Runoff of storm water might also carry surface residual containing bacteria Listed in Table 13 below are the LASs in the Coosa River Basin and the eight (8) LASs that could potentially impact the stream segments in this TMDL are identified.

Table 13: Permitted Land Application Systems in the Coosa River Basin

LAS Name	Permit No.	County	Type	Flow (MGD)	Impaired Stream Watershed
Amicalola Falls State Park WPCP	GAJ020045	Dawson	Municipal	0.0143	Etowah River GAR031501040312 Etowah River GAR031501040313
Crystal Falls WPCP	GAJ040044	Dawson	Municipal	0.035	Etowah River GAR031501040313
Dawson Forest WRF (Etowah Water & Sewer Authority)	GAJ020232	Dawson	Municipal	1	Etowah River GAR031501040312 Etowah River GAR031501040313
Dawsonville WPCP	GAJ020179	Dawson	Municipal	0.4	Etowah River GAR031501040312 Etowah River GAR031501040313
Gold Creek WRF (City of Dawsonville)	GAJ020025	Dawson	Municipal	0.5	Etowah River GAR031501040312 Etowah River GAR031501040313
Lake Arrowhead WRF	GAJ030819	Cherokee	Municipal	0.3	Shoal Creek GAR031501040701
Dalton Utilities - Riverbend Land Application Site	GAJ020056	Whitfield	Municipal	40	Conasauga River GAR031501010502 Conasauga River GAR031501010511
Waleska Campus WPCP (Reinhardt University)	GAJ020260	Cherokee	Municipal	0.036	Moore Creek GAR031501040703 Shoal Creek GAR031501040701

Source: Georgia Pollutant Discharge Elimination System, GA EPD, Atlanta, Georgia, 2022

3.2.3.3 Landfills

Leachate from landfills may contain bacteria that could at some point reach surface waters. Sanitary (or municipal landfills) are the most likely to serve as a source of bacteria. These types of landfills receive household wastes, animal manure, offal, hatchery and poultry processing plant wastes, dead animals, and other types of wastes. Older sanitary landfills were not lined, and most have been closed. Those that remain active and have not been lined operate as construction/demolition landfills. Currently active sanitary landfills are lined and have leachate collection systems. All landfills, excluding inert landfills, are now required to install environmental monitoring systems for groundwater and methane sampling. Table 14 provides the landfills located in the Coosa River Basin.

Table 14: Permitted Landfills in the Coosa River Basin

Facility Name	Permit Number	County	Interest Type	Operating Status
Bartow Co - SR 140 Adairsville (SL)	008-012D(SL)	Bartow	SW- Municipal Solid Waste Landfill	Archived
Bartow Co - SR 294 Emerson (SL)	008-008D(SL)	Bartow	SW- Construction & Demolition Landfill	Closed/PCC
Bartow County Board of Commissioners	008-016D(SL)	Bartow	SW- Municipal Solid Waste Landfill	Operating
Calhoun - Harris Rd Ph 4 (L)	064-014D(L)	Gordon	SW- Construction & Demolition Landfill	Closed/PCC
Chattooga Co - CR323 (Holland - Chattoogaville Rd) MSWL	027-008D(SL)	Chattooga	SW- Municipal Solid Waste Landfill	Permit Expired
Chattooga Co - Penn Bridge Rd Ph 1 (SL)	027-006D(SL)	Chattooga	SW- Municipal Solid Waste Landfill	Closed/PCC
CHEMICAL PRODUCTS CORP		Bartow	SW- Private Industrial Landfill	
Chemical Products Corp - Old Mill Rd (LI)		Bartow	SW- Private Industrial Landfill	
DADE COUNTY LANDFILL	041-004D(SL)	Dade	SW- Municipal Solid Waste Landfill	Closed/PCC
Dalton - Old Dixie Hwy Ph 2 (SL)	155-021D(SL)	Whitfield	SW- Municipal Solid Waste Landfill	Closed/PCC
Dalton - Old Dixie Hwy Ph 4 (SL)	155-027D(SL)	Whitfield	SW- Municipal Solid Waste Landfill	Closed/PCC
Dalton - Old Dixie Hwy Ph 5 (SL)	155-044D(SL)	Whitfield	SW- Municipal Solid Waste Landfill	Closed/PCC
Dalton - Rocky Face (WS) Ph 2 (SL)	155-033D(SL)	Whitfield	SW- Municipal Solid Waste Landfill	Closed/PCC
Dalton - Waugh St Ph 1 (L)	155-034D(L)	Whitfield	SW- Construction & Demolition Landfill	Closed/PCC
Dalton - Waugh St Ph 2 (L)	155-037D(L)	Whitfield	SW- Construction & Demolition Landfill	Closed/PCC
Dalton -McGaughey Ch/Coahulla Crk (L)	155-043D(L)	Whitfield	SW- Construction & Demolition Landfill	Closed/PCC
Dow Chemicals (LI)		Whitfield	SW- Private Industrial Landfill	
EVANS' FARM COAL ASH LANDFILL (LI)		Floyd	SW- Private Industrial Landfill	

Facility Name	Permit Number	County	Interest Type	Operating Status
Fannin Co - SR 5 Ph 2 (SL)	055-007D(SL)	Fannin	SW- Municipal Solid Waste Landfill	Closed/PCC
Floyd Co - Berry Hill Rd (SL)	057-009D(SL)	Floyd	SW- Municipal Solid Waste Landfill	Closed/PCC
Floyd Co - Rome Walker Mtn Rd C/D Landfill	057-021D(C&D)	Floyd	SW- Construction & Demolition Landfill	Operating
Georgia Power - Plant Bowen		Bartow	SW- Private Industrial Landfill	
Georgia Power- Plant Hammond		Floyd	SW- Private Industrial Landfill	
Georgia Power, Huffaker Road		Floyd	SW- Private Industrial Landfill	
Gilmer Co - SR 52 N/TV Tower Ph 1-5 (SL)	061-010D(SL)	Gilmer	SW- Municipal Solid Waste Landfill	Closed/PCC
Gordon Co - Harris Rd Ph 2 (SL)	064-011D(SL)	Gordon	SW- Municipal Solid Waste Landfill	Closed/PCC
Gordon Co - Lick Creek Rd Ranger (SL)	064-010D(SL)	Gordon	SW- Municipal Solid Waste Landfill	Archived
Gordon Co - Redbone Ridges Rd (SL)	064-016D(SL)	Gordon	SW- Municipal Solid Waste Landfill	Operating
Haralson Co - HCSWA US 78	071-006D(C&D)	Haralson	SW- Construction & Demolition Landfill	Operating
Haralson Co - US 78 Bremen (Site # 2) MSWL	071-005D(SL)	Haralson	SW- Municipal Solid Waste Landfill	Closed/PCC
Haralson Co - US 78 Bremen (Site #1) MSWL	071-004D(SL)	Haralson	SW- Municipal Solid Waste Landfill	Closed/PCC
INLAND CONTAINER CORP		Floyd	SW- Private Industrial Landfill	
LaFayette-Coffman Springs Rd (L)	146-013D(L)	Walker	SW- Construction & Demolition Landfill	Operating
Monier Resources (LI)		Floyd	SW- Private Industrial Landfill	
Murray Co - US 411 Dennis Mill Rd (SL)	105-004D(SL)	Murray	SW- Municipal Solid Waste Landfill	Archived
Murray Co - US 411 Westside (L)	105-012D(L)	Murray	SW- Construction & Demolition Landfill	Closed/PCC
Murray Co - US 411 Westside (SL)	105-011D(SL)	Murray	SW- Municipal Solid Waste Landfill	Closed/PCC

Facility Name	Permit Number	County	Interest Type	Operating Status
Murray County Landfill	105-014D(MSWL)	Murray	SW- Municipal Solid Waste Landfill	Operating
OLD DIXIE SANITARY LANDFILL	155-047D(SL)	Whitfield	SW- Municipal Solid Waste Landfill	Operating
Pickens Co - Jones Mtn Rd Ph 2 (SL)	112-005D(SL)	Pickens	SW- Municipal Solid Waste Landfill	Archived
Pickens Co - Jones Mtn Rd Ph 3 (SL)	112-006D(SL)	Pickens	SW- Municipal Solid Waste Landfill	Archived
Pickens Co-Jones Mtn Rd Westside (SL)	112-007D(SL)	Pickens	SW- Municipal Solid Waste Landfill	Closed/PCC
Polk Co - US 278 Cedartown Ph 2 (SL)	115-005D(SL)	Polk	SW- Municipal Solid Waste Landfill	Closed/PCC
Polk County Solid Waste Management	115-008D(SL)	Polk	SW- Municipal Solid Waste Landfill	Operating
Rome- Walker Mtn Rd Ph 1, 2 & 3 (SL)	057-013D(SL)	Floyd	SW- Municipal Solid Waste Landfill	Closed/PCC
ROSSVILLE DEVELOPMENT COPORATION		Walker	SW- Private Industrial Landfill	
Southern States - Hodges Mine Road C&D Landfill	008-019D(C&D)	Bartow	SW- Construction & Demolition Landfill	Construction
STD Brands Chem - Shavers Farm (SI)		Walker	SW- Private Industrial Landfill	
Steele Brothers - SR 341 (LI)		Walker	SW- Private Industrial Landfill	
Steele Brothers - SR341 (LI)		Walker	SW- Private Industrial Landfill	
Walker Co - Marble Top Rd Site 2 MSWL	146-015D(MSWL)	Walker	SW- Construction & Demolition Landfill	Operating
Walker Co. Landfill	146-003D(SL)	Walker	SW- Municipal Solid Waste Landfill	Closed/PCC
Walker Mountain Road	057-020D(MSWL)	Floyd	SW- Municipal Solid Waste Landfill	Operating
Whitestone Valley C&D Landfill	112-008D(C&D)	Pickens	SW- Construction & Demolition Landfill	Operating
Whitfield Co - DWRSWA Old Dixie Hwy Baled Carpet		Whitfield	SW- Commercial Industrial Landfill	
Whitfield Co - DWRSWA Old Dixie Hwy Baled Carpet		Whitfield	SW- Commercial Industrial Landfill	

Source: Land Protection Branch, GA EPD, 2022

4.0 ANALYTICAL APPROACH

The process of developing bacteria TMDLs for the Coosa River Basin listed segments includes the determination of the following:

- The current critical bacteria load to the stream under existing conditions;
- The TMDL for similar conditions under which the current load was determined; and
- The percent reduction in the current critical bacteria load necessary to achieve the TMDL.

The calculation of the bacteria load at any point in a stream requires the bacteria concentration and stream flow. The Loading Curve Approach was used to determine the current bacteria load and the TMDL. For the listed segments, fecal coliform sampling data were sufficient to calculate at least one 30-day geometric mean to compare with the regulatory criteria (see Appendix A).

4.1 Loading Curve Approach

For segments with revised TMDLs, listings of some segments were based on spill data that is no longer available. Therefore, a current critical load and percent reduction cannot be calculated. However, the annual average flow determined using USGS StreamStats, (USGS, 2017) and then used to calculate the TMDL. The StreamStats annual average flow for each stream with a revised TMDL is given in Table A-1 in Appendix A.

For those segments in which sufficient water quality data were collected to calculate at least one 30-day geometric mean above the regulatory standard, the loading curve approach was used to calculate the current critical load.

The TMDLs for this document were calculated using data from nearby USGS gages and the applicable water quality criterion. These nearby stream gages have relatively similar watershed characteristics, including land use, slope, and drainage area. The stream flows were estimated by multiplying the measured stream flow by the ratio of the listed stream drainage area to the gaged stream drainage area. Table 15 provides the USGS stream gages used to estimate the flow for the listed stream segments. For each listed segment, the drainage areas and USGS gages used to estimate stream flow are given in Table A-2 in Appendix A. The current critical load was compared to summer and winter seasonal TMDL curves to determine the required percent reduction.

Table 15: USGS Flow Gages Used to Estimate Stream Flow in the 303(d) Listed Segments in the Coosa River Basin

Stream Segment	Location	USGS Station No.	USGS Station Name	Flow Gage Drainage Area (sq miles)
Alpine Creek	Unnamed Tributary at Peach Orchard Road to Stateline	02398000	Chattooga River at Summerville, GA	192
Bow Creek	Headwaters to Oostanaula River	02387600	Oothkalooga Creek at GA 53 Spur at Calhoun, GA	62.6

Stream Segment	Location	USGS Station No.	USGS Station Name	Flow Gage Drainage Area (sq miles)
Crane Eater Creek	Headwaters to Coosawattee River			
Dead Mans Branch	Headwaters to Polecat Creek			
Robbins Creek	Headwaters to Oostanaula River	02387600	Oothkalooga Creek at GA 53 Spur at Calhoun, GA	62.6
Tanyard Branch	Tributary 200 feet upstream of U.S. 278 to Big Cedar Creek/Cedar Creek			
Town Creek	Moss Lake to the Oostanaula River			
East Armuchee Creek	Dry Creek to West Armuchee Creek	02388350	Armuchee Creek at Old Dalton Road near Rome, GA	224
Etowah River	Amicalola Creek to Yellow Creek	02390050	Etowah River at Kelly Bridge Road near Matt, GA	277
Etowah River	Yellow Creek to Brewton Creek			
Euharlee Creek	Simpson Creek to Tributary 0.2 miles downstream of U.S. 278	02394820	Euharlee Creek at US 278 at Rockmart, GA	42.1
Simpson Creek	Headwaters to Hutchings Creek			
Flat Creek	Headwaters to S.R. 382	02381600	Fausett Creek near Talking Rock, GA	9.99
Fuller Branch	Brannon Lake to Salacoa Creek	02382200	Talking Rock Creek near Hinton, GA	119
Lick Creek	Redbud Creek to Salacoa Creek			
Ninetynine Branch	Headwaters to Salacoa Creek			

Stream Segment	Location	USGS Station No.	USGS Station Name	Flow Gage Drainage Area (sq miles)
Redbud Creek	Headwaters to Defoor Walters Lake			
Ketchum Branch	Headwaters to Coahula Creek	02385500	Mill Creek at Dalton, GA	40
Mill Creek	North Fork Mill Creek to Haig Mill Creek	02385500	Mill Creek at Dalton, GA	40
Moore Creek	Headwaters to Shoal Creek	02392360	Shoal Creek at GA 108 near Waleska, GA	56.5
Pettit Creek	Aubrey Lake to Satterfield Branch	02395120	Two Run Creek near Kingston, GA	33.1
Pin Hook Creek	Pickens Co. Line to Salacoa Creek			

The current critical loads were determined using fecal coliform data collected within a 30-day period to calculate the geometric means and multiplying these values by the arithmetic means of the flows measured at the time the water quality samples were collected. Georgia's instream bacteria standards are based on a geometric mean of samples collected over a 30-day period, with samples collected at least 24 hours apart. To reflect this in the load calculation, the bacteria loads are expressed as 30-day accumulated loads with units of counts per 30 days. This is described by the equation below:

$$L_{critical} = C_{geomean} \times Q_{mean}$$

Where:

$L_{critical}$ = current critical bacteria load
$C_{geomean}$ = bacteria concentration as a 30-day geometric mean
Q_{mean} = stream flow as an arithmetic mean

The current estimated critical load is dependent on the fecal coliform concentrations and stream flows measured during the sampling events. The number of events sampled is usually 16 per year. Thus, these loads do not represent the full range of flow conditions or loading rates that can occur. Therefore, it must be kept in mind that the current critical loads used only represent the worst-case scenario that occurred during the sampling period.

The maximum bacteria load at which the instream bacteria criteria will be met can be determined using a variation of the equation above. By setting C equal to the seasonal, instream bacteria standard, the load will equal the TMDL. However, the TMDL is dependent on stream flow. Figures in Appendix A graphically illustrate that the TMDL is a continuum for the range of flows (Q) that can occur in the stream over time. There are two TMDL curves shown in these figures. One represents the summer TMDL for the period May through October when the 30-day geometric mean standard is 200 counts/100 mL. The second curve represents the winter TMDL for the period November through April when the 30-day geometric mean standard is 1,000 counts/100 mL. The equations for these two TMDL curves are:

$$TMDL_{summer} = 200 \text{ counts/100 mL (as a 30-day geometric mean)} \times Q$$

$$TMDL_{winter} = 1{,}000 \text{ counts/100 mL (as a 30-day geometric mean)} \times Q$$

The graphs show the relationship between the current critical load ($L_{critical}$) and the TMDL. The TMDL for a given stream segment is the load for the mean flow corresponding to the current critical load. This is the point where the current load exceeds the TMDL curve by the greatest amount. This critical TMDL can be represented by the following equation:

$$TMDL_{critical} = C_{standard} \times Q_{mean}$$

Where:

$TMDL_{critical}$ = critical bacteria TMDL load
$C_{standard}$ = seasonal bacteria standard (as a 30-day geometric mean)
summer - 200 counts/100 mL as fecal coliform
winter - 1,000 counts/ 100 mL as fecal coliform
Q_{mean} = stream flow as an arithmetic mean

A 30-day geometric mean load that plots above the respective seasonal TMDL curve represents an exceedance of the instream bacteria standard. The difference between the current critical load and the TMDL curve represents the load reduction required for the stream segment to meet the appropriate instream bacteria standard. There is also a single sample maximum criterion of 4,000 counts per 100 mL for fecal coliform. If a single sample exceeds the maximum criterion, and the seasonal geometric mean criteria is also exceeded, then the TMDL is based on the criteria exceedance requiring the largest load reduction.

For future *E. coli* TMDLs, one curve will represent the summer TMDL for the period May through October when the 30-day geometric mean standard is 126 counts/100 mL. The second curve will represent the winter TMDL for the period November through April when the 30-day geometric mean standard is 265 counts/100 mL. The equations for these two TMDL curves are:

$$TMDL_{summer} = 126 \text{ counts/100 mL (as a 30-day geometric mean)} \times Q$$

$$TMDL_{winter} = 265 \text{ counts/100 mL (as a 30-day geometric mean)} \times Q$$

The TMDL for a given stream segment is the load for the mean flow corresponding to the current critical fecal coliform load. This is the point where the current fecal coliform load exceeds the fecal coliform TMDL curve by the greatest amount. This critical TMDL can be represented by the following equation:

$$TMDL_{critical} = C_{standard} \times Q_{mean}$$

Where:

$TMDL_{critical}$ = critical bacteria TMDL load

$C_{standard}$ = seasonal bacteria standard (as a 30-day geometric mean)
summer – 126 counts/100 mL as *E. coli*
winter – 265 counts/ 100 mL as *E. coli*
Q_{mean} = stream flow as an arithmetic mean

There is also a statistical threshold value (STV) maximum criterion for the months of May through October (410 counts per 100 mL for *E. coli)* and November through April (861 counts per 100 mL for *E. coli*). If a single sample exceeds the STV maximum criterion, and the seasonal geometric mean criteria is also exceeded, then the TMDL is based on the criteria exceedance requiring the largest load reduction.

For a TMDL, the percent load reduction can be expressed as follows:

$$\text{Percent Load Reduction} = \frac{L_{critical} - TMDL_{critical}}{L_{critical}} \times 100$$

The current critical loads and the TMDLs are expressed as equations that show the loads as a function of the total flow at any given time. The general equations for the critical load and the TMDL are:

$$L_{critical} = Q_{total} \times C_{geomean}$$

Where:
$L_{critical}$ = current critical bacteria load
$C_{geomean}$ = bacteria concentration as a 30-day geometric mean
Q_{total} = stream flow

$$TMDL = C_{criterion} \times Q_{total}$$

Where:
TMDL = total maximum daily load
$C_{criterion}$ = criterion
Q_{total} = estimated instantaneous flow

5.0 TOTAL MAXIMUM DAILY LOAD

A Total Maximum Daily Load (TMDL) is the amount of a pollutant that can be assimilated by the receiving waterbody without exceeding the applicable water quality standard. In this case, it is the seasonal bacterial standard. A TMDL is the sum of the individual wasteload allocations (WLAs) for point sources and load allocations (LAS) for nonpoint sources, as well as natural background (40 CFR 130.2) for a given waterbody. The TMDL must also include a margin of safety (MOS), either implicitly or explicitly, that accounts for the uncertainty in the relationship between pollutant loads and the water quality response of the receiving waterbody. TMDLs can be expressed in terms of either mass per time, toxicity, or other appropriate measures. For bacteria, the TMDLs are expressed as counts per 30 days as a geometric mean.

A TMDL is expressed as follows:

$$\text{TMDL} = \Sigma\text{WLAs} + \Sigma\text{LAs} + \text{MOS}$$

The TMDL calculates the WLAs and LAs with a margin of safety to meet the stream's water quality standards. The allocations are based on estimates that use the best available data and provide the basis to establish or modify existing controls so that water quality standards can be achieved. In developing a TMDL, it is important to consider whether adequate data are available to identify the sources, and to understand the fate and transport of the pollutant(s) to be controlled.

TMDLs may be developed using a phased approach. Under a phased approach, the TMDL includes: 1) WLAs that confirm existing limits and controls or lead to new limits, and 2) LAs that confirm existing controls or include implementing new controls (USEPA, 1991). A phased TMDL requires additional data be collected to determine if load reductions required by the TMDL are leading to the attainment of water quality standards.

Watershed-based plans may be developed to address and assess both point and nonpoint sources. These plans establish a schedule or timetable for the installation and evaluation of source control measures, data collection, and assessment of water quality standard attainment. Future monitoring of the listed segments water quality may be used to evaluate this phase of the TMDL, and if necessary, to reallocate the loads.

The existing fecal coliform loads calculated for each listed stream segment are based on sampling data and measured or estimated flows and represent the sum of the total loads from all point and nonpoint sources for the segment. In situations where two or more adjacent segments are listed, the fecal coliform loads to each segment are individually evaluated on a localized watershed basis. The following sections describe the various bacteria TMDL components.

5.1 Wasteload Allocations

The following information is provided for facilities that discharge into or within approximately 25 miles upstream of the listed segment. Facilities further upstream may be included in future TMDLs following additional analysis from GA EPD.

5.1.1 Wastewater Treatment Facilities

The wasteload allocation (WLA) is the portion of the receiving water's loading capacity that is allocated to existing or future point sources. WLAs are provided to the point sources from POTW and Non-POTW wastewater treatment systems with NPDES end-of-pipe effluent limits established to meet the applicable water quality standard. In addition, the permits include routine monitoring and reporting requirements.

For facilities that currently have a bacteria effluent limit, the permit information, receiving stream, impaired stream and WLAs are provided in Table 16. In most cases, the WLAs are calculated based on permitted or design flow and permitted bacteria concentration. However, for those facilities whose wastewater is reused, the bacteria limit to discharge into surface waters may be overly restrictive and for these facilities the WLA is calculated using the permitted flow and permitted bacteria concentration. This was expressed as an accumulated load over a 30-day period and presented in units of counts per 30 days. If there is a new facility or a facility expands its capacity and the permitted flow increases, the wasteload allocation for the facility will be the permitted flow times the appropriate water quality criteria, either 200 counts/100 mL for fecal coliform or 126 counts/100 mL for E. coli as a 30-day geometric mean.

Table 16: WLAs for the Facilities that Currently have Bacteria Limits in the Coosa River Basin

Facility Name	NPDES Permit No.	Receiving Stream	Listed Stream Segment	Bacterial Indictor	WLA (counts/ 30 days)	30 Day Geometric Mean Concentration (counts/100mL)
America's Best Value Inn & Suites WPCP	GA0048887	Little Swamp Creek	Conasauga River GAR031501010511	Fecal coliform	2.93E+08	200
				E. coli	1.84E+08	126
Cohutta Springs Conference Center WPCP	GAG550118	Sumac Creek	Conasauga River GAR031501010502	Fecal coliform	4.57E+08	200
			Conasauga River GAR031501010511	*E. coli*	2.88E+08	126
Dawnville Elementary School WPCP	GA0034002	Tributary to Moody Branch	Conasauga River GAR031501010502	Fecal coliform	1.41E+08	200
			Conasauga River GAR031501010511	*E. coli*	8.85E+07	126
Dawson Forest WRF (Etowah Water & Sewer Authority)	GA0050319	Etowah River	Etowah River GAR031501040312	Fecal coliform	1.58E+10	200
			Etowah River GAR031501040313	*E. coli*	2.72E+10	126
Fairmount WPCP	GA0046388	Salacoa Creek	Pin Hook Creek GAR031501020601	Fecal coliform	2.34E+09	200
				E. coli	1.48E+09	126
Judson Vick WPCP (Chatsworth Water Works)	GA0032490	Holly Creek	Conasauga River GAR031501010502	Fecal coliform	3.51E+10	200
			Conasauga River GAR031501010511	*E. coli*	2.21E+10	126
Menlo WPCP	GA0047023	Alpine Creek	Alpine Creek GAR031501050514	Fecal coliform	1.16E+09	200
				E. coli	7.30E+08	126
Mill Creek WPCP (Chatsworth Water Works)	GA0050281	Mill Creek (Murray Co.)	Conasauga River GAR031501010502	Fecal coliform	1.17E+10	200
			Conasauga River GAR031501010511	*E. coli*	7.38E+09	126

Mill Creek WPCP (Dalton Utilities)	GA0038946	Mill Creek (Whitfield Co.)	Conasauga River GAR031501010502 Conasauga River GAR031501010511 Mill Creek GAR031501010316	Fecal coliform	1.76E+09	200
				E. coli	1.11E+09	126
Mountainbrook Center WPCP	GA0034959	Tributary to Moore Creek	Moore Creek GAR031501040703 Shoal Creek GAR031501040701	Fecal coliform	7.03E+07	200
				E. coli	4.43E+07	126
Rockmart WPCP	GA0025607	Tributary to Euharlee Creek	Euharlee Creek GAR031501041410	Fecal coliform	3.51E+10	200
				E. coli	2.21E+10	126
Whispering Pines Mobile Home Park WPCP	GA0023426	Ketchum Creek	Conasauga River GAR031501010502 Conasauga River GAR031501010511 Ketchum Branch GAR031501010314	Fecal coliform	4.45E+08	200
				E. coli	2.80E+08	126
Whitfield Mountain View Acres WPCP (Dalton Utilities)	GA0047848	Stone Branch	Conasauga River GAR031501010502 Conasauga River GAR031501010511	Fecal coliform	9.84E+08	200
				E. coli	6.20E+08	126
W.L. Swain Elementary School WPCP	GAG550058	Robbins Creek	Robbins Creek GAR031501030211	Fecal coliform	1.16E+08	200
				E. coli	7.30E+07	126

Non-POTW facilities that discharge sanitary wastewater directly or sanitary waste streams commingled with other waste streams will be given a bacteria effluent limit in their permit. Potential WLAs for existing Non-POTW discharges without bacteria permit limits would be the facility design flow multiplied by the appropriate bacteria criterion, either 200 counts/100 mL for fecal coliform or 126 counts/100 mL for *E. coli* as a 30-day geometric mean. For these facilities, it is not known if their discharge contains any bacteria at levels that would exceed the instream water quality criteria because the type of treatment processes employed. Therefore, existing Non-POTW facilities may be required to submit bacteria data with their NPDES permit renewal application. Non-POTW discharges must collect, analyze, and submit appropriate bacteria data from at least 4 samples collected 24 hours apart within a 30-day period. GA EPD will evaluate these data and determine if a permit limit for bacteria is needed. There are currently two (2) known existing Non-POTW discharges without bacteria permit limits in the contributing watersheds, as noted in Table 7.

5.1.2 Regulated Stormwater Discharges

State and Federal Rules define stormwater discharges covered by NPDES permits as point sources. However, stormwater discharges are from diffuse sources and there are multiple stormwater outfalls. Stormwater sources (point and nonpoint) are different than traditional NPDES permitted sources in four respects: 1) they do not produce a continuous (pollutant loading) discharge; 2) their pollutant loading depends on the intensity, duration, and frequency of rainfall events, over which the permittee has no control; 3) the activities contributing to the pollutant loading may include the various allowable activities of others, and control of these activities is not solely within the discretion of the permittee; and 4) they do not have wastewater treatment plants that control specific pollutants to meet numerical limits.

The intent of stormwater NPDES permits is not to treat the water after collection, but to reduce the exposure of stormwater to pollutants by implementing various controls. It would be infeasible and prohibitively expensive to control pollutant discharges from each stormwater outfall. Therefore, stormwater NPDES permits require the establishment of controls or BMPs to reduce the pollutants entering the environment.

The wasteload allocations from stormwater discharges (WLAsw) associated with MS4s are estimated based on the percentage of urban area in each watershed covered by the MS4 stormwater permit. At this time, the portion of each watershed that goes directly to a permitted storm sewer or is non-permitted sheet flow or diffuse runoff has not been clearly defined. Thus, it is assumed that approximately 70 percent of stormwater runoff from the regulated urban area is collected by the MS4s. This can be represented by the following equation:

$$WLA_{SW} = Q_{WLAsw} \times C_{standard}$$

where: WLA_{SW} = Wasteload Allocation for permitted storm water runoff from all MS4 urban areas

Q_{WLAsw} = Runoff from all MS4 urban areas conveyed through permitted storm water structures

$Q_{WLAsw} = \Sigma Q_{urban} \times 0.7$

ΣQ_{urban} = Sum of all storm water runoff from MS4 urban

$C_{standard}$ = seasonal fecal coliform standard (as a 30-day geometric mean)

summer – 200 counts/100 mL as fecal coliform
winter – 1000 counts/ 100 mL as fecal coliform
summer – 126 counts/100 mL as *E. coli*
winter – 265 counts/ 100 mL as *E. coli*

For stormwater permits, compliance with the terms and conditions of the permit is effective implementation of the WLA to the Maximum Extent Practicable (MEP) and demonstrates consistency with the assumptions and requirements of the TMDL. GA EPD acknowledges that progress with the assumptions and requirements of the TMDL by stormwater permittees may take one or more permit iterations. Achieving the TMDL reductions may constitute compliance with a SWMP or a SWPPP, provided the MEP definition is met, even where the numeric percent reduction may not be achieved so long as reasonable progress is made toward attainment of water quality standards using an iterative BMP process.

5.1.3 Concentrated Animal Feeding Operations

Wet manure facilities are either included under a State-issued LAS General Permit or an NPDES General Permit. A small number of wet manure operations have an individual NPDES permit. Dry manure facilities are not required to obtain permits. None of the wet manure or dry manure facilities have discharges. Presently, there is one wet or dry manure CAFOs located in the watersheds of the listed segments in the Coosa River Basin, but they were not provided an explicit WLA as they do not have a discharge.

5.2 Load Allocations

The load allocation is the portion of the receiving water's loading capacity that is attributed to existing or future nonpoint sources or to natural background sources. Nonpoint sources are identified in 40 CFR 130.6 as follows:

- Residual waste;
- Land disposal;
- Agricultural and silvicultural;
- Mines;
- Construction;
- Saltwater intrusion; and
- Urban stormwater (non-permitted).

The LA is calculated as the remaining portion of the TMDL load available, after allocating the WLA, WLAsw, and the MOS, using the following equation:

$$LA = TMDL - (\Sigma\ WLA + \Sigma\ WLAsw + MOS)$$

As described above, there are two types of load allocations: loads to the stream independent of precipitation, including sources such as failing septic systems, leachate from landfills, animals in the stream, leaking sewer system collection lines, and background loads; and loads associated with bacteria accumulation on land surfaces that is washed off during storm events, including runoff from saturated LAS fields. Currently, it is not possible to partition the various sources of load allocations. In the future, after additional data has been collected, it may be possible to partition the load allocation by source.

5.3 Seasonal Variation

The Georgia bacteria criteria are seasonal. One set of criteria applies to the summer season, while a different set applies to the winter season. To account for seasonal variations, the critical loads for each listed segment were determined from sampling data obtained during both summer and winter seasons, when possible. The TMDL and percent reduction for each listed segment is based on the season in which the critical load occurred. The TMDLs for each season, for any given flow, are presented as equations in Section 5.5.

5.4 Margin of Safety

The MOS is a required component of TMDL development. There are two basic methods for incorporating the MOS: 1) implicitly incorporate the MOS using conservative modeling assumptions to develop allocations; or 2) explicitly specify a portion of the TMDL as the MOS and use the remainder for allocations. For this TMDL, an explicit MOS of 10 percent of the TMDL was used.

5.5 Total Bacteria Load

The bacteria TMDL for the listed stream segment is dependent on the time of year, the stream flow, and the applicable state water quality standard. In January 2022, the Georgia DNR Board adopted new bacteria criteria for "Fishing" and "Drinking Water" designated uses using the bacterial indicators *E. coli* and enterococci. These bacteria are better indicators for human health illnesses. The adopted criteria have the same estimated illness rate (8 per 1000 swimmers) as the previously established fecal coliform criteria. Since this TMDL is based on fecal coliform data, but the current bacteria criterion is *E. coli*, this TMDL will use both fecal coliform and *E. coli* as the bacterial indicators.

The total maximum daily seasonal fecal coliform loads for Georgia are given below:

$TMDL_{summer}$ = 200 counts/100 mL (as a 30-day geometric mean) x Q

$TMDL_{winter}$ = 1000 counts/100 mL (as a 30-day geometric mean) x Q

TMDL = 4000 counts/100 mL (instantaneous) x Q

The total maximum daily seasonal *E. coli* loads for Georgia are given below:

$TMDL_{summer}$ = 126 counts/100 mL (as a 30-day geometric mean) x Q

$TMDL_{winter}$ = 265 counts/100 mL (as a 30-day geometric mean) x Q

TMDL = 410 counts/100 mL (instantaneous) x Q

For purposes of determining necessary load reductions required to meet the instream water quality criteria, the current critical TMDL was determined. This load is the product of the applicable seasonal bacteria standard and the mean flow used to calculate the current fecal coliform critical load. It represents the sum of the allocated loads from point (WLA and WLA_{sw}) and nonpoint (LA) sources located within the immediate drainage area of the listed segment, and a margin of safety (MOS). For these calculations, the bacteria contributed by a permitted facility to the WLA was the product of the bacteria permitted limit and the monthly permitted discharge. The current critical loads and corresponding TMDLs, WLAs (WLA and WLA_{sw}), LAs, MOSs, and percent load reductions for the Coosa River Basin listed stream segments are presented in Table 17.

The relationships of the current critical loads to the TMDLs are shown graphically in Appendix A. The vertical distance between the two values represents the load reductions necessary to achieve the TMDLs. Because of the localized nature of the load evaluations, the calculated bacterial load reductions pertain to point and nonpoint sources occurring within the immediate drainage area of the listed segment. The current critical values represent a worst-case scenario for the limited set of data. Thus, the load reductions required are conservative estimates, and should be sufficient to prevent exceedances of the instream bacteria standard for a wide range of conditions.

Evaluation of the relationship between instream water quality and the potential sources of pollutant loading is an important component of TMDL development and is the basis for later implementation of corrective measures and BMPs. For the current TMDLs, the association between bacterial loads and the potential sources occurring within the sub-watershed of each segment was examined on a qualitative basis.

Table 17: Bacteria Loads and Required Load Reductions

Assessment Unit ID	Stream Segment	Description	Bacterial Indicator	Current Load (counts/ 30 days)	TMDL Components					Reduction Required
					WLA (counts/ 30 days)(1)	WLAsw (counts/ 30 days)	LA (counts/ 30 days)	MOS (counts/ 30 days)	TMDL (counts/ 30 days)	
GAR031501050514	Alpine Creek	Unnamed Tributary at Peach Orchard Road to Stateline	Fecal coliform	1.57E+11	1.16E+09	--	5.49E+10	6.23E+09	6.23E+10	60%
			E. coli	(2)	7.30E+08	--	3.46E+10	3.92E+09	3.92E+10	Undetermined (3)
GAR031501030207	Bow Creek	Headwaters to Oostanaula River	Fecal coliform	7.10E+11	--	--	8.81E+10	9.79E+09	9.79E+10	86%
			E. coli	2.18E+11	--	--	4.73E+10	5.26E+09	5.26E+10	76%
GAR031501020806	Crane Eater Creek	Headwaters to Coosawattee River	Fecal coliform	1.17E+11	--	--	3.91E+10	4.34E+09	4.34E+10	63%
			E. coli	2.47E+12	--	--	8.70E+11	9.67E+10	9.67E+11	61%
GAR031501010513	Dead Mans Branch	Headwaters to Polecat Creek	Fecal coliform	1.15E+13	--	--	8.30E+11	9.22E+10	9.22E+11	92%
			E. coli	7.29E+10	--	--	3.84E+10	4.27E+09	4.27E+10	41%
GAR031501030512	East Armuchee Creek	Dry Creek to West Armuchee Creek	Fecal coliform	4.34E+11	--	--	1.48E+11	1.65E+10	1.65E+11	62%
			E. coli	(2)	--	--	9.33E+10	1.04E+10	1.04E+11	Undetermined (3)
GAR031501040312	Etowah River	Amicalola Creek to Yellow Creek	Fecal coliform	4.40E+12	2.93E+10	1.58E+10	2.74E+12	3.10E+11	3.10E+12	30%
			E. coli	1.42E+13	1.84E+10	2.72E+10	4.73E+12	5.30E+11	5.30E+12	63%
GAR031501040313	Etowah River	Yellow Creek to Brewton Creek*	Fecal coliform	4.34E+12	2.93E+10	1.58E+10	2.95E+12	3.32E+11	3.32E+12	23%
			E. coli	1.11E+13	1.84E+10	2.72E+10	5.08E+12	5.69E+11	5.69E+12	49%
GAR031501041410	Euharlee Creek	Simpson Creek to Tributary 0.2 miles downstream of U.S. 278	Fecal coliform	1.36E+11	3.51E+10	--	2.09E+10	6.23E+09	6.23E+10	54%
			E. coli	(2)	2.21E+10	--	1.32E+10	3.92E+09	3.92E+10	Undetermined (3)
GAR031501020409	Flat Creek	Headwaters to S.R. 382	Fecal coliform	2.62E+11	--	--	7.71E+10	8.57E+09	8.57E+10	67%
			E. coli	(2)	--	--	4.86E+10	5.40E+09	5.40E+10	Undetermined (3)
GAR031501020611	Fuller Branch	Brannon Lake to Salacoa Creek	Fecal coliform	1.44E+10	--	--	6.85E+09	7.61E+08	7.61E+09	47%
			E. coli	1.20E+10	--	--	4.58E+09	5.09E+08	5.09E+09	58%
GAR031501010314	Ketchum Branch	Headwaters to Coahula Creek	Fecal coliform	5.45E+09	4.45E+08	6.81E+07	1.23E+09	1.93E+08	1.93E+09	65%
			E. coli	(2)	2.80E+08	4.29E+07	7.72E+08	1.22E+08	1.22E+09	Undetermined (3)
GAR031501020605	Lick Creek	Redbud Creek to Salacoa Creek	Fecal coliform	4.33E+11	--	--	2.13E+11	2.37E+10	2.37E+11	45%
			E. coli	(2)	--	--	1.34E+11	1.49E+10	1.49E+11	Undetermined (3)

Assessment Unit ID	Stream Segment	Description	Bacterial Indicator	Current Load (counts/ 30 days)	TMDL Components					Reduction Required
					WLA (counts/ 30 days)(1)	WLAsw (counts/ 30 days)	LA (counts/ 30 days)	MOS (counts/ 30 days)	TMDL (counts/ 30 days)	
GAR031501010316	Mill Creek	North Fork Mill Creek to Haig Mill Creek	Fecal coliform	1.74E+11	1.76E+09	7.69E+09	6.85E+10	8.66E+09	8.66E+10	50%
			E. coli	(2)	1.11E+09	4.84E+09	4.32E+10	5.46E+09	5.46E+10	Undetermined (3)
GAR031501040703	Moore Creek	Headwaters to Shoal Creek	Fecal coliform	2.10E+11	7.03E+07	--	3.99E+10	4.44E+09	4.44E+10	79%
			E. coli	(2)	4.43E+07	--	2.51E+10	2.80E+09	2.80E+10	Undetermined (3)
GAR031501020609	Ninetynine Branch	Headwaters to Salacoa Creek	Fecal coliform	1.78E+11	--	--	4.48E+10	4.98E+09	4.98E+10	72%
			E. coli	(2)	--	--	2.82E+10	3.14E+09	3.14E+10	Undetermined (3)
GAR031501041311	Pettit Creek	Aubrey Lake to Satterfield Branch	Fecal coliform	1.45E+14	--	3.27E+12	2.93E+13	3.62E+12	3.62E+13	75%
			E. coli	(2)	--	7.03E+11	6.31E+12	7.80E+11	7.80E+12	Undetermined (3)
GAR031501020601	Pin Hook Creek	Pickens Co. Line to Salacoa Creek	Fecal coliform	2.15E+11	2.34E+09	--	1.07E+11	1.22E+10	1.22E+11	43%
			E. coli	(2)	1.48E+09	--	6.75E+10	7.66E+09	7.66E+10	Undetermined (3)
GAR031501020610	Redbud Creek	Headwaters to Defoor Walters Lake	Fecal coliform	4.19E+11	--	--	9.84E+10	1.09E+10	1.09E+11	74%
			E. coli	3.08E+10	--	--	9.47E+09	1.05E+09	1.02E+10	66%
GAR031501030211	Robbins Creek	Headwaters to Oostanaula River	Fecal coliform	3.16E+10	1.16E+08	--	2.52E+10	2.81E+09	2.81E+10	11%
			E. coli	(2)	7.30E+07	--	1.59E+10	1.77E+09	1.77E+10	Undetermined (3)
GAR031501041407	Simpson Creek	Headwaters to Hutchings Creek	Fecal coliform	4.76E+10	--	--	1.34E+10	1.49E+09	1.49E+10	69%
			E. coli	2.32E+11	--	--	3.73E+10	4.14E+09	4.14E+10	82%
GAR031501050118	Tanyard Branch	Tributary 200 feet upstream of U.S. 278 to Big Cedar Creek/Cedar Creek	Fecal coliform	4.69E+11	--	--	2.62E+10	2.91E+09	2.91E+10	94%
			E. coli	(2)	--	--	1.65E+10	1.83E+09	1.83E+10	Undetermined (3)
GAR031501030212	Town Creek	Moss Lake to the Oostanaula River	Fecal coliform	1.57E+11	--	--	3.80E+10	4.22E+09	4.22E+10	73%
			E. coli	1.77E+12	--	--	5.01E+10	5.57E+09	5.57E+10	97%
Revised TMDLs										
GAR031501050402	Chappel Creek	Tributary 200 feet downstream of US 27 to the Chattooga River/Trion	Fecal coliform	(4)	--	--	9.88E+10	1.10E+10	1.10E+11	Undetermined (3)
			E. coli	(4)	--	--	6.22E+10	6.92E+09	6.92E+10	Undetermined (3)
GAR031501040805	Chastain Branch	Tributary to Noonday Creek	Fecal coliform	(4)	--	5.94E+09	4.42E+09	1.15E+09	1.15E+10	Undetermined (3)
			E. coli	(4)	--	3.74E+09	2.78E+09	7.25E+08	7.25E+09	Undetermined (3)

Assessment Unit ID	Stream Segment	Description	Bacterial Indicator	Current Load (counts/ 30 days)	TMDL Components					Reduction Required
					WLA (counts/ 30 days)(1)	WLAsw (counts/ 30 days)	LA (counts/ 30 days)	MOS (counts/ 30 days)	TMDL (counts/ 30 days)	
GAR031501010502	Conasauga River	Hwy 286 to Holly Creek	Fecal coliform	(4)	5.06E+10	1.94E+11	6.71E+12	7.72E+11	7.72E+12	Undetermined (3)
			E. coli	(4)	3.19E+10	1.22E+11	4.22E+12	4.87E+11	4.87E+12	Undetermined (3)
GAR031501010511	Conasauga River	Holly Creek to Thomason Creek	Fecal coliform	(4)	5.09E+10	2.77E+11	7.17E+12	8.33E+11	8.33E+12	Undetermined (3)
			E. coli	(4)	3.21E+10	1.74E+11	4.52E+12	5.25E+11	5.25E+12	Undetermined (3)
GAR031501020202	Cox Creek	Headwaters to Ellijay River	Fecal coliform	(4)	--	--	2.34E+10	2.60E+09	2.60E+10	Undetermined (3)
			E. coli	(4)	--	--	1.48E+10	1.64E+09	1.64E+10	Undetermined (3)
GAR031501041001	Kellogg Creek	Lake Allatoona Tributary	Fecal coliform	(4)	--	7.88E+09	1.01E+10	2.00E+09	2.00E+10	Undetermined (3)
			E. coli	(4)	--	4.97E+09	6.37E+09	1.26E+09	1.26E+10	Undetermined (3)
GAR031501030502	Lavender Creek	Headwaters to Armuchee Creek	Fecal coliform	(4)	--	--	1.03E+11	1.14E+10	1.14E+11	Undetermined (3)
			E. coli	(4)	--	--	6.48E+10	7.20E+09	7.20E+10	Undetermined (3)
GAR031501041003	Rowland Springs Branch	Lake Allatoona Tributary	Fecal coliform	(4)	--	1.60E+09	3.16E+10	3.69E+09	3.69E+10	Undetermined (3)
			E. coli	(4)	--	1.01E+09	1.99E+10	2.32E+09	2.32E+10	Undetermined (3)
GAR031501040701	Shoal Creek	Hwy 140 to Lake Allatoona	Fecal coliform	(4)	7.03E+07	9.76E+06	6.64E+11	7.38E+10	7.38E+11	Undetermined (3)
			E. coli	(4)	4.43E+07	6.15E+06	4.18E+11	4.65E+10	4.65E+11	Undetermined (3)
GAR031501041004	Stamp Creek	Headwaters to Lake Allatoona	Fecal coliform	(4)	--	1.88E+07	1.75E+11	1.95E+10	1.95E+11	Undetermined (3)
			E. coli	(4)	--	1.19E+07	1.10E+11	1.23E+10	1.23E+11	Undetermined (3)

Notes:
(1) The assigned bacterial load from the NPDES permitted facility for WLA was determined as the product of the permitted flow and bacteria permit limit.
(2) Sample was not analyzed for *E. coli*, therefore critical load calculation not possible.
(3) Percent reduction could not be determined due to absence of current load calculation.
(4) Critical loading could not be determined due to no samples collected.

6.0 RECOMMENDATIONS

The TMDL process consists of an evaluation of the sub-watersheds for each 303(d) listed stream segment to identify, as best as possible, the sources of the bacteria loads causing the stream to exceed instream standards. The TMDL analysis was performed using the best available data to specify WLAs and LAs that will meet bacteria water quality criteria to support the use classification specified for the listed segment.

This TMDL represents part of a long-term process to reduce bacteria loading to meet water quality standards in the Coosa River Basin. Implementation strategies will be reviewed and the TMDL will be refined, as necessary, in the next phase (next five-year cycle). The phased approach will support progress toward water quality standards attainment in the future. In accordance with USEPA TMDL guidance, the TMDL may be revised based on the results of future monitoring and source characterization data efforts. The following recommendations emphasize further source identification and involve the collection of data to support the current allocations and subsequent source reductions.

6.1 Monitoring

Water quality monitoring is conducted at several locations across the State each year. Sampling is conducted statewide by GA EPD personnel in Atlanta, Augusta, Brunswick, Cartersville, and Tifton. Additional monitoring sites are added as necessary.

In the case where a watershed-based plan has been developed for a listed stream segment, an appropriate water quality monitoring program will be outlined. The monitoring program will be developed to help identify the various bacteria sources. The monitoring program may be used to verify the 303(d) stream segment listings. This will be especially valuable for those segments where limited data resulted in the listing.

6.2 Bacteria Management Practices

Based on the findings of the source assessment, NPDES point source bacteria loads from wastewater treatment facilities usually do not significantly contribute to the impairment of the listed stream segments. This is because most facilities are required to treat to levels corresponding to instream water quality criteria. Sources of bacteria in urban areas include wastes that are attributable to domestic animals, leaks and overflows from sanitary sewer systems, illicit discharges of sanitary waste, leaking septic systems, runoff from improper disposal of waste materials, and leachate from both operational and closed landfills. In agricultural areas, potential sources of bacteria may include CAFOs, animals grazing in pastures, dry manure storage facilities and lagoons, chicken litter storage areas, and direct access of livestock to streams. Wildlife, especially waterfowl and mammals living close to or in water environments, can be a significant source of bacteria.

Management practices are recommended to reduce bacteria source loads to the listed 303(d) stream segments, with the result of achieving the instream bacteria standard criteria. These recommended management practices include:

- Compliance with NPDES (wastewater, construction, industrial stormwater, and/or MS4) permit limits and requirements;

- Ensure storm water management plans are in place and being implemented by the local governments located in the watershed;
- Implementation of Georgia's *Statewide Nonpoint Source Management Plan* (GA EPD, 2019)
- Implementation of recommended Water Quality management practices in the *Coosa-North Georgia Water Planning Region*;
- Implementation of *Georgia's Best Management Practices for Forestry* (GFC, 2009);
- Implementation of *Best Management Practices for Georgia Agriculture* (GSWCC, 2013) and Adoption of National Resource Conservation Service (NRCS) Conservation Practices for agriculture;
- Adoption and implementation of the *Georgia Stormwater Management Manual* (ARC, 2016) and the *Coastal Stormwater Supplement to the Georgia Stormwater Management Manual* (CWP, 2009) to facilitate water quality treatment of stormwater runoff, including bacteria removal, through structural stormwater BMP installation.

6.2.1 Point Source Approaches

The NPDES permit program provides a basis for municipal, industrial, and stormwater permits, monitoring and compliance with permit limitations, and appropriate enforcement actions for violations. In accordance with GA EPD rules and regulations, all discharges from point source facilities are required to follow the conditions of their NPDES permit at all times. Wastewater treatment plants with the potential for bacteria in their discharge are given end-of-pipe limits to meet the applicable water quality standard. In addition, the permits include routine monitoring and reporting requirements.

Achieving the TMDL reductions may constitute compliance with a SWMP or SWPPP, provided the MEP definition is met, even where the numeric percent reduction may not be achieved so long as reasonable progress is made toward attainment of water quality standards using an iterative BMP process.

6.2.2 Nonpoint Source Approaches

GA EPD is the lead agency for implementing the State's Nonpoint Source Management Program, as described in Georgia's *Statewide Nonpoint Source Management Plan* (GA EPD, 2019). GA EPD will continue to work with local governments, agricultural, and forestry agencies such as the Natural Resources Conservation Service (NRCS), the Georgia Soil and Water Conservation Commission (GSWCC), and the Georgia Forestry Commission (GFC) to foster the implementation of BMPs that address nonpoint source pollution. The following sections describe programs in place and recommendations which should result in reducing nonpoint source loads of bacteria in Georgia's surface waters.

6.2.2.1 Agricultural Sources

GA EPD should coordinate with other agencies that are responsible for agricultural activities in the state to address issues concerning bacteria loading from agricultural lands. It is recommended that information such as livestock populations by sub-watershed, animal access to streams, manure storage and application practices be periodically reviewed so that watershed evaluations can be updated to reflect current conditions. It is also recommended that BMPs be utilized to reduce the number of bacteria transported to surface waters from agricultural sources to the maximum extent practicable.

The following three organizations have primary responsibility for working with farmers to promote soil and water conservation, and to protect water quality:

- University of Georgia (UGA - Cooperative Extension Service);
- Georgia Soil and Water Conservation Commission (GSWCC); and
- Natural Resources Conservation Service (NRCS).

UGA has faculty, County Cooperative Extension Agents, and technical specialists who provide services in several key areas relating to agricultural impacts on water quality. GA EPD designated the GSWCC as the lead agency for agricultural Nonpoint Source Management in the State. The GSWCC develops nonpoint source management programs and conducts educational activities to promote conservation and protection of land and water devoted to agricultural uses.

The NRCS works with federal, state, and local governments to provide financial and technical assistance to farmers. The NRCS develops standards and specifications for BMPs that are to be used to improve, protect, and/or maintain our state's natural resources. In addition, every five years, the NRCS conducts the National Resources Inventory (NRI). The NRI is a statistically-based sample of land use and natural resource conditions and trends that covers non-federal land in the United States.

The NRCS is also providing technical assistance to the GSWCC and the GA EPD with the Georgia River Basin Planning Program. Planning activities associated with this program will describe conditions of the agricultural natural resource base once every five years. It is recommended that the GSWCC and the NRCS continue to encourage BMP implementation, education efforts, and river basin surveys with regard to river basin planning.

6.2.2.2 Urban Sources

Both point and nonpoint sources of bacteria can be significant in the Coosa River Basin urban areas. Urban sources of bacteria can best be addressed using a strategy that involves stormwater management, public participation, and intergovernmental coordination to reduce the discharge of pollutants to the maximum extent practicable. Management practices, control techniques, public education, and other appropriate methods and provisions may be employed. The following activities and programs conducted by cities, counties, and state agencies are recommended:

- Implement stormwater BMPs that incorporate water quality treatment and/or pollutant removal

- Uphold requirements that all new and replacement sanitary sewerage systems be designed to minimize discharges into storm sewer systems;

- Further develop and streamline mechanisms for reporting and correcting illicit connections, breaks, surcharges, and general sanitary sewer system problems;

- Continue efforts to increase public awareness and education towards the impact of human activities in urban settings on water quality, ranging from the consequences of industrial and municipal discharges to the activities of individuals in residential neighborhoods.

6.3 Reasonable Assurance

GA EPD is responsible for administering and enforcing laws to protect the waters of the State. Reasonable assurance ensures that a TMDL's wasteload and load allocations are properly distributed to meet the applicable water quality standards. Without such distribution, a TMDL's ability to serve as an effective guidepost for water quality improvement is significantly diminished. Federal regulations implementing the CWA require that effluent limits in permits be consistent with "the assumptions and requirements of any available [WLA]" in an approved TMDL [40 CFR 122.44(d)(1)(vii)(B)]. NPDES point source permits will be given effluent limits in the permit consistent with the individual WLAs specified in the TMDL.

The GA EPD is the lead agency for implementing the State's Nonpoint Source Management Program. Regulatory responsibilities that have a bearing on nonpoint source pollution include establishing water quality standards and use classifications, assessing and reporting water quality conditions, and regulating land use activities that may affect water quality. Georgia is working with local governments, agricultural and forestry agencies, such as the NRCS the GSWCC, and the GFC, to foster the implementation of BMPs to address nonpoint sources. In addition, public education efforts will be targeted to individual stakeholders to provide information regarding the use of BMPs to protect water quality.

6.4 Public Participation

A thirty-day public notice is being provided for this TMDL. During that time, the TMDL will be available on the GA EPD website, a copy of the TMDL will be provided on request, and the public will be invited to provide comments on the TMDL.

7.0 INITIAL TMDL IMPLEMENTATION PLAN

This plan identifies applicable State-wide programs and activities that may be employed to manage point and nonpoint sources of bacteria loads for the segment in the Coosa River Basin. Local watershed planning and management initiatives will be fostered, supported, or developed through a variety of mechanisms. Implementation may be addressed by Watershed-Based Plans or other assessments funded by Section 319(h) grants, the local development of watershed protection plans, or "Targeted Outreach" initiated by GA EPD. These initiatives will supplement or possibly replace this initial implementation plan. Implementation actions should also be guided by the recommended management practices and actions contained within each applicable Regional Water Plan developed as part of *Georgia's Comprehensive State-wide Water Management Plan* implementation (Georgia Water Council, 2008).

7.1 Impaired Segments

This initial plan is applicable to the following waterbody that was added to Georgia's 2022 Integrated 305(b)/303(d) List of not supporting waters in *Water Quality in Georgia 2020-2021* (GA EPD, 2022) available on the GA EPD website. The following tables summarize the descriptive information provided in the 303(d) list.

Table 18: Stream Segments Listed on the 2022 303(d) List for Bacteria in the Coosa River Basin

Stream Segment	Location	Assessment Unit ID	Segment Length (miles)	Designated Use
Alpine Creek	Unnamed Tributary at Peach Orchard Road to Stateline	GAR031501050514	3	Fishing
Bow Creek	Headwaters to Oostanaula River	GAR031501030207	5	Fishing
Crane Eater Creek	Headwaters to Coosawattee River	GAR031501020806	4	Fishing
Dead Mans Branch	Headwaters to Polecat Creek	GAR031501010513	2	Fishing
East Armuchee Creek	Dry Creek to West Armuchee Creek (formerly Furnace Creek to West Armuchee Creek)	GAR031501030512	14.6	Fishing
Etowah River	Amicalola Creek to Yellow Creek	GAR031501040312	5	Fishing
Etowah River	Yellow Creek to Brewton Creek*	GAR031501040313	4	Fishing
Euharlee Creek	Simpson Creek to Tributary 0.2 miles downstream of U.S. 278	GAR031501041410	2	Drinking Water, Fishing
Flat Creek	Headwaters to S.R. 382	GAR031501020409	4.3	Fishing

Stream Segment	Location	Assessment Unit ID	Segment Length (miles)	Designated Use
Fuller Branch	Brannon Lake to Salacoa Creek	GAR031501020611	1	Fishing
Ketchum Branch	Headwaters to Coahula Creek	GAR031501010314	1	Fishing
Lick Creek	Redbud Creek to Salacoa Creek	GAR031501020605	4	Fishing
Mill Creek	North Fork Mill Creek to Haig Mill Creek	GAR031501010316	3	Drinking Water, Fishing
Moore Creek	Headwaters to Shoal Creek	GAR031501040703	4	Fishing
Ninetynine Branch	Headwaters to Salacoa Creek	GAR031501020609	5	Fishing
Pettit Creek	Aubrey Lake to Satterfield Branch	GAR031501041311	6	Fishing
Pin Hook Creek	Pickens Co. Line to Salacoa Creek	GAR031501020601	7.6	Fishing
Redbud Creek	Headwaters to Defoor Walters Lake	GAR031501020610	4	Fishing
Robbins Creek	Headwaters to Oostanaula River	GAR031501030211	4.9	Fishing
Simpson Creek	Headwaters to Hutchings Creek	GAR031501041407	2.6	Fishing
Tanyard Branch	Tributary 200 feet upstream of U.S. 278 to Big Cedar Creek/Cedar Creek	GAR031501050118	1	Fishing
Town Creek	Moss Lake to the Oostanaula River	GAR031501030212	3	Fishing

Table 19: Stream Segments with Revised TMDLs for Bacteria in the Coosa River Basin

Stream Segment	Location	Assessment Unit ID	Segment Length (miles)	Designated Use	Original TMDL Action ID Number, Agency, and Year
Chappel Creek	Tributary 200 feet downstream of US 27 to the Chattooga River/Trion	GAR031501050402	2.8	Fishing	# 241 US EPA 1998
Chastain Branch	Tributary to Noonday Creek	GAR031501040805	2	Fishing	# 244 US EPA 1998
Conasauga River	Hwy 286 to Holly Creek	GAR031501010502	18	Fishing, Drinking Water	# 322 US EPA 1998

Stream Segment	Location	Assessment Unit ID	Segment Length (miles)	Designated Use	Original TMDL Action ID Number, Agency, and Year
Conasauga River	Holly Creek to Thomason Creek	GAR031501010511	14	Fishing	# 322 US EPA 1998
Cox Creek	Headwaters to Ellijay River	GAR031501020202	3	Fishing	# 342 US EPA 1998
Kellogg Creek	Lake Allatoona Tributary	GAR031501041001	3	Fishing	# 597 US EPA 1998
Lavender Creek	Headwaters to Armuchee Creek	GAR031501030502	7.8	Fishing	# 665 US EPA 1998
Rowland Springs Branch	Lake Allatoona Tributary	GAR031501041003	2	Fishing	# 1017 US EPA 1998
Shoal Creek	Hwy 140 to Lake Allatoona	GAR031501040701	15.5	Fishing	# 1071 US EPA 1998
Stamp Creek	Headwaters to Lake Allatoona	GAR031501041004	9.9	Fishing	# 1141 US EPA 1998

The water use classification for the listed stream segments in the Coosa River Basin is “Fishing.” The criterion violated is listed as fecal coliform. The potential causes listed include urban runoff and nonpoint sources. The “Fishing” bacteria water quality standards as approved by US EPA Region 4 on January 20, 2021, and applicable at the time of listing was as follows:

(c) Fishing: Propagation of Fish, Shellfish, Game and Other Aquatic Life; primary contact recreation in and on the water for the months of May – October, secondary contact recreation in and on the water for the months of November – April; or for any other use requiring water of a lower quality.

(i) Bacteria:

1. For the months of May through October, when water contact recreation activities are expected to occur, fecal coliform not to exceed a geometric mean of 200 counts per 100 mL based on at least four samples collected from a given sampling site over a 30-day period at intervals not less than 24 hours. Should water quality and sanitary studies show fecal coliform levels from non-human sources exceed 200 counts per 100 mL (geometric mean) occasionally, then the allowable geometric mean fecal coliform shall not exceed 300 counts per 100 mL in lakes and reservoirs and 500 counts per 100 mL in free flowing freshwater streams. For the months of November through April, fecal coliform not to exceed a geometric mean of 1,000 counts per 100 mL based on at least four samples collected from a given sampling site over a 30-day period at intervals not less than 24 hours and not to exceed a maximum of 4,000 counts per 100 mL for any sample. The State does not encourage swimming in these surface waters since a number of factors which are beyond the control of any State regulatory agency contribute to elevated levels of bacteria.

2. For waters designated as shellfish growing areas by the Georgia DNR Coastal Resources Division, the requirements will be consistent with those established by the State and Federal agencies responsible for the National Shellfish Sanitation Program. The requirements are found in National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish, 2007 Revision (or most recent version), Interstate Shellfish Sanitation Conference, U.S. Food and Drug Administration.

In January 2022, the Georgia DNR Board adopted new bacteria criteria for "Fishing" and "Drinking Water" designated uses using the bacterial indicators *E. coli* and enterococci. These bacteria are better indicators for human health illnesses. The adopted criteria have the same estimated illness rate (8 per 1000 swimmers) as the previously established criteria. EPA approved the proposed standards August 31, 2022. Since this TMDL was written after EPA approved the new bacteria criteria, the TMDL will use both bacterial indicators. The use classification water quality standards for fecal coliform bacteria, as stated in the *State of Georgia's Rules and Regulations for Water Quality Control*, Chapter 391-3-6-.03(6)(c)(iii) (GA EPD, 2022), are:

(c) Fishing: Propagation of Fish, Shellfish, Game and Other Aquatic Life; primary contact recreation in and on the water for the months of May – October, secondary contact recreation in and on the water for the months of November – April; or for any other use requiring water of a lower quality.

(i) Bacteria:

1. Estuarine waters: For the months of May through October, when primary water contact recreation activities are expected to occur, culturable enterococci not to exceed a geometric mean of 35 counts per 100 mL based on at least four samples collected from a given sampling site over a 30-day period at intervals not less than 24 hours. There shall be no greater than a ten percent excursion frequency of an enterococci statistical threshold value (STV) of 130 counts per 100 mL the same 30-day interval.

   For the months of November through April, culturable enterococci not to exceed a geometric mean of 74 counts per 100 mL based on at least four samples collected from a given sampling site over a 30-day period at intervals not less than 24 hours. There shall be no greater than a ten percent excursion frequency of an enterococci statistical threshold value (STV) of 273 counts per 100 mL in the same 30-day interval.

2. All other fishing waters: For the months of May through October, when primary water contact recreation activities are expected to occur, culturable E. coli not to exceed a geometric mean of 126 counts per 100 mL based on at least four samples collected from a given sampling site over a 30-day period at intervals not less than 24 hours. There shall be no greater than a ten percent excursion frequency of an E. coli statistical threshold value (STV) of 410 counts per 100 mL in the same 30-day interval.

   For the months of November through April, culturable E. coli not to exceed a geometric mean of 265 counts per 100 mL based on at least four samples collected from a given sampling site over a 30-day period at intervals not less than 24 hours. There shall be no greater than a ten percent excursion frequency of an E. coli statistical threshold value (STV) of 861 counts per 100 mL in the same 30-day interval.

3. The State does not encourage swimming in these surface waters since a number of factors which are beyond the control of any State regulatory agency contribute to elevated levels of bacteria.

4. For waters designated as shellfish growing areas by the Georgia DNR Coastal Resources Division, the requirements will be consistent with those established by the State and Federal agencies responsible for the National Shellfish Sanitation Program. The requirements are found in National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish, 2007 Revision (or most recent version), Interstate Shellfish Sanitation Conference, U.S. Food and Drug Administration.

7.2 Potential Sources

An important part of the TMDL analysis is the identification of potential source categories. A source assessment characterizes the known and suspected bacteria sources in the watershed. Sources are broadly classified as either point or nonpoint sources. A point source is defined as a discernable, confined, and discrete conveyance from which pollutants are or may be discharged to surface waters. Point sources of bacteria include NPDES permittees discharging treated wastewater and storm water. Nonpoint sources of bacteria are diffuse sources that cannot be identified as entering the waterbody at a single location. These sources generally involve land use activities that contribute bacteria to streams during a rainfall runoff event.

NPDES point source bacteria loads from wastewater treatment facilities usually do not contribute to impairments. This is because these facilities are required to treat to levels corresponding to instream water quality criteria. However, point sources can and do fail, which may contribute to bacteria loads through leaks and overflows from sanitary sewer systems, CAFOs, or leachate from operational landfills.

Nonpoint sources of bacteria in urban areas include wastes that are attributable to domestic animals, illicit discharges of sanitary waste, leaking septic systems, runoff from improper disposal of waste materials, and leachate from closed landfills. In non-urban areas, potential sources of bacteria may include animals grazing in pastures, dry manure storage facilities and lagoons, chicken litter storage areas, and direct access of livestock to streams. Wildlife, especially waterfowl and mammals living close to or in water environments, can be a significant source of bacteria.

7.3 Management Practices and Activities

GA EPD is responsible for administering and enforcing laws to protect the waters of the State and is the lead agency for implementing the State's Nonpoint Source Management Program. Georgia is working with local governments, agricultural and forestry agencies such as the Georgia Department of Agriculture, NRCS, GSWCC, and GFC to foster implementation of BMPs that address nonpoint source pollution. The following management practices are recommended to reduce bacteria loads to stream segments:

- Sustain compliance with NPDES treated wastewater permit requirements;
- Sustain compliance with NPDES MS4 permit requirements, where applicable;
- Compliance with future NPDES Industrial General Permit requirements, including where applicable, achieving benchmark levels for monitored constituents;
- Ensure storm water management plans are in place and being implemented by the local governments, and by the industrial facilities located in the watershed;
- Implementation of Georgia's *Statewide Nonpoint Source Management Plan* (GA EPD, 2019);
- Adoption and implementation of the *Georgia Stormwater Management Manual* (ARC, 2016) to facilitate water quality treatment of stormwater runoff, including bacteria removal, through structural stormwater BMP installation;
- Further develop and streamline mechanisms for reporting and correcting illicit discharges, breaks, surcharges, and general sanitary sewer system problems;
- Uphold requirements that all new and replacement sanitary sewage systems be designed to minimize discharges into storm sewer systems;
- Adoption of local ordinances (i.e., septic tanks, storm water, etc.) that address local water quality;
- Continue efforts to increase public awareness and education regarding the impact of human activities on water quality, ranging from industrial and municipal discharges to individual's activities in residential neighborhoods;

- Continue working with Federal, State, and local agencies and owners of sites where cleanup measures are necessary, and in developing control measures to prevent future releases of constituents of concern;
- Implementation of recommended Water Quality management practices in the *Coosa-North Georgia Regional Water Plan* (GA EPD, 2017);
- Adoption of NRCS Conservation Practices for primarily agricultural lands;
- Application of BMPs appropriate to both urban and rural land uses, where applicable; and
- Ongoing public education efforts on the sources of bacteria and common-sense approaches to lessen the impact of this contaminant on surface waters.

7.4 Monitoring

GA EPD encourages local governments and municipalities to develop and continue water quality monitoring programs. These programs can help pinpoint various bacteria sources, as well as verify the 303(d) stream segment listings. This will be particularly valuable for those segments where listing was based on limited data. In addition, regularly scheduled sampling will determine if there has been some improvement in the water quality of the listed stream segments. GA EPD would like to particularly commend and encourage downgradient sampling on the LAS system and supports expanding monitoring to quarterly or monthly sampling schedules. GA EPD is available to assist in providing technical guidance regarding the preparation of monitoring plans and Sampling Quality Assurance Plans (SQAP).

7.5 Future Action

This Initial TMDL Implementation Plan includes a general approach to pollutant source identification, as well as management practices to address pollutants. In the future, GA EPD will continue to determine and assess the appropriate point and non-point source management measures needed to achieve the TMDLs and to protect and restore water quality in impaired waterbodies.

For point sources, any wasteload allocations for wastewater treatment plant facilities will be implemented in the form of water quality-based effluent limitations in NPDES permits. Any wasteload allocations for regulated stormwater will be implemented in the form of BMPs in the NPDES permits. Contributions of bacteria from regulated communities may also be managed using permit requirements such as watershed assessments, watershed protection plans, and long-term monitoring. These measures will be directed through current point source management programs.

GA EPD will work to support watershed restoration, improvement and protection projects that address nonpoint source pollution. This is a process whereby GA EPD and/or Regional Commissions or other agencies or local governments, under a contract with GA EPD, will develop a Watershed Management Plan intended to address water quality at the small watershed level (HUC 10 or smaller). These plans will be developed as resources and willing partners become available. The development of these plans may be funded via several grant sources, including, but not limited to: CWA Section 319(h), Section 604(b), and/or Section 106 grant funds. These plans are intended for implementation upon completion.

Any Watershed Management Plan that specifically addresses a waterbody contained within this TMDL will supersede this Initial TMDL Implementation Plan for that waterbody once GA EPD accepts and/or approves the plan. Watershed Management Plans intended to address this TMDL and other water quality concerns, prepared for GA EPD, and for which GA EPD and/or the GA EPD Contractor are responsible, will contain at a minimum the US EPA's 9 Elements of Watershed Planning:

1) An identification of the sources or groups of similar sources contributing to nonpoint source pollution to be controlled to implement load allocations or achieve water quality standards. Sources should be identified at the subcategory level with estimates of the extent to which they are present in the watershed (e.g., X numbers of cattle feedlots needing upgrading, Y acres of row crops needing improved bacteria control, or Z linear miles of eroded streambank needing remediation);

2) An estimate of the load reductions expected for the management measures;

3) A description of the NPS management measures that will need to be implemented to achieve the load reductions established in the TMDL or to achieve water quality standards;

4) An estimate of the sources of funding needed, and/or authorities that will be relied upon, to implement the plan;

5) An information/education component that will be used to enhance public understanding of and participation in implementing the plan;

6) A schedule for implementing the management measures that is reasonably expeditious;

7) A description of interim, measurable milestones (e.g., amount of load reductions), improvement in biological or habitat parameters) for determining whether management measures or other control actions are being implemented;

8) A set of criteria that can be used to determine whether substantial progress is being made towards attaining water quality standards and, if not, the criteria for determining whether the plan needs to be revised; and;

9) A monitoring component to evaluate the effectiveness of the implementation efforts, measured against the criteria established under item 8.

The public will be provided an opportunity to participate in the development of Watershed Management Plans that address impaired waters and to comment on them before they are finalized.

GA EPD will continue to offer technical and financial assistance (when and where available) to complete Watershed Management Plans that address the impaired waterbodies listed in this and other TMDL documents. Assistance may include but will not be limited to:

- Assessments of pollutant sources within watersheds;
- Determinations of appropriate management practices to address impairments;
- Identification of potential stakeholders and other partners;
- Developing a plan for outreach to the public and other groups;
- Assessing the resources needed to implement the plan upon completion; and

- Other needs determined by the lead organization responsible for plan development.

GA EPD will also make this same assistance available, if needed, to proactively address water quality concerns. This assistance may be in the way of financial, technical, or other aid and may be requested and provided outside of the TMDL process or schedule.

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Appendix A

Single Sample and 30-day Geometric Mean Fecal Coliform Monitoring Data

Table A-1: Drainage Areas and Annual Average flow values for segments with revised TMDLs

Revised 303(d) Listed Stream Segment	Segment Location	Annual Average Stream Flow (ft^3/s)	Watershed Area (sq miles)
Chappel Creek	Tributary 200 feet downstream of US 27 to the Chattooga River/Trion	14.5	10.1
Chastain Branch	Tributary to Noonday Creek	1.52	1.2
Conasauga River	Hwy 286 to Holly Creek	1020	624
Conasauga River	Holly Creek to Thomason Creek	1100	688
Cox Creek	Headwaters to Ellijay River	3.44	1.66
Kellogg Creek	Lake Allatoona Tributary	2.64	2.09
Lavender Creek	Headwaters to Armuchee Creek	15.1	11.5
Rowland Springs Branch	Lake Allatoona Tributary	4.87	3.87
Shoal Creek	Hwy 140 to Lake Allatoona	97.5	66.2
Stamp Creek	Headwaters to Lake Allatoona	25.7	18.1

Table A-2: Drainage Areas and USGS Flow Gages used to Estimate Stream Flow in 303(d) Listed Streams

303(d) Listed Stream Segment	Segment Location	Impaired Stream Drainage Area (sq miles)	USGS Station ID	USGS Description	USGS Drainage Area (sq miles)
Alpine Creek	Unnamed Tributary at Peach Orchard Road to Stateline	8.889	02398000	Chattooga River at Summerville, GA	192
Bow Creek	Headwaters to Oostanaula River	8.445	02387600	Oothkalooga Creek at GA 53 Spur at Calhoun, GA	62.6
Crane Eater Creek	Headwaters to Coosawattee River	7.340			
Dead Mans Branch	Headwaters to Polecat Creek	1.595			
Robbins Creek	Headwaters to Oostanaula River	6.701	02387600	Oothkalooga Creek at GA 53 Spur at Calhoun, GA	62.6
Tanyard Branch	Tributary 200 feet upstream of U.S. 278 to Big Cedar Creek/Cedar Creek	6.234			
Town Creek	Moss Lake to the Oostanaula River	7.970			
East Armuchee Creek	Dry Creek to West Armuchee Creek	43.55	02388350	Armuchee Creek at Old Dalton Road near Rome, GA	224
Etowah River	Amicalola Creek to Yellow Creek	282.4	02390050	Etowah River at Kelly Bridge Road near Matt, GA	277
Etowah River	Yellow Creek to Brewton Creek	303.1			

303(d) Listed Stream Segment	Segment Location	Impaired Stream Drainage Area (sq miles)	USGS Station ID	USGS Description	USGS Drainage Area (sq miles)
Euharlee Creek	Simpson Creek to Tributary 0.2 miles downstream of U.S. 278	45.36	02394820	Euharlee Creek at US 278 at Rockmart, GA	42.1
Simpson Creek	Headwaters to Hutchings Creek	3.860			
Flat Creek	Headwaters to S.R. 382	5.851	02381600	Fausett Creek near Talking Rock, GA	9.99
Fuller Branch	Brannon Lake to Salacoa Creek	2.041	02382200	Talking Rock Creek near Hinton, GA	119
Lick Creek	Redbud Creek to Salacoa Creek	18.80			
Ninetynine Branch	Headwaters to Salacoa Creek	5.534			
Redbud Creek	Headwaters to Defoor Walters Lake	4.222			
Ketchum Branch	Headwaters to Coahula Creek	0.6379	02385500	Mill Creek at Dalton, GA	40
Mill Creek	North Fork Mill Creek to Haig Mill Creek	28.61	02385500	Mill Creek at Dalton, GA	40
Moore Creek	Headwaters to Shoal Creek	2.996	02392360	Shoal Creek at GA 108 near Waleska, GA	56.5
Pettit Creek	Aubrey Lake to Satterfield Branch	31.93	02395120	Two Run Creek near Kingston, GA	33.1
Pin Hook Creek	Pickens Co. Line to Salacoa Creek	19.97			

Table A-3: RV_14_4641 – Alpine Creek at Oak Hill Alpine Road near Menlo, GA Water Quality Monitoring Data

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
01/13/2021	110	12.50	166	11	7.21E+10	4.34E+11
01/20/2021	230	9.31				
02/02/2021	300	12.92				
02/09/2021	100	11.16				
05/24/2021	95	8.01	**506**	8	1.57E+11	6.23E+10
06/03/2021	80	7.59				
06/07/2021	**17000**	9.07				

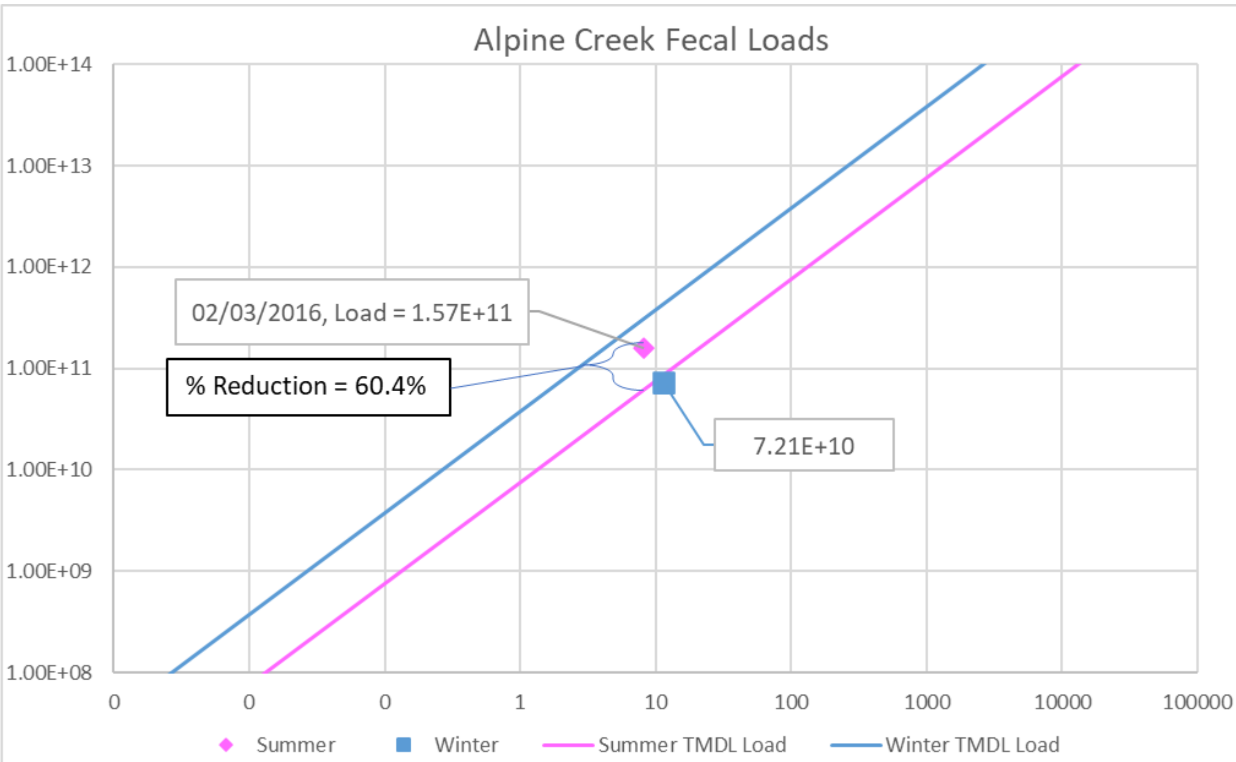

Figure A-1: Alpine Creek Fecal Coliform Geometric Mean Loads and Summer and Winter TMDL Curves

Table A-4: RV_14_4480 – Bow Creek at Old Rome Dalton Road NW near Sugar Valley, GA Water Quality Monitoring Data

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
01/24/2018	500	3.55	234	13	1.16E+11	4.95E+11
01/29/2018	300	6.17				
02/06/2018	500	11.39				
02/14/2018	40	31.16				
05/09/2018	2200	7.73	**1451**	13	7.10E+11	9.79E+10
05/31/2018	1800	16.46				
06/04/2018	800	16.86				
06/07/2018	1400	10.66				
09/19/2018	1700	3.39	**752**	6	1.60E+11	4.26E+10
10/10/2018	500	5.13				
10/18/2018	500	8.35				
11/01/2018	300	6.73	390	14	2.10E+11	5.39E+11
11/14/2018	700	25.90				
11/27/2018	1100	12.95				
11/29/2018	100	11.41				

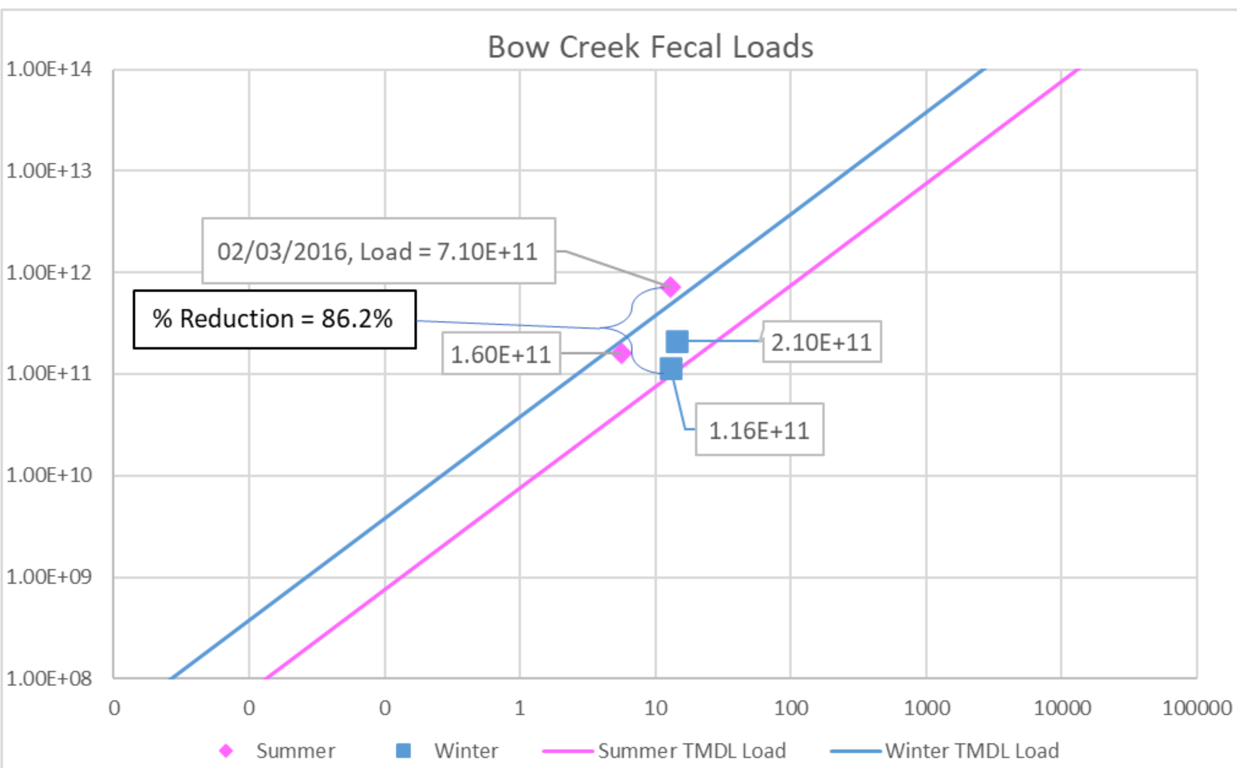

Figure A-2: Bow Creek Fecal Coliform Geometric Mean Loads and Summer and Winter TMDL Curves

Table A-5: RV_14_4823 – Crane Eater Creek at Pine Chapel Road near Calhoun, GA Water Quality Monitoring Data

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
03/12/2018	2200	29.66	234	15	1.31E+11	5.61E+11
03/19/2018	130	12.55				
04/04/2018	130	9.61				
04/10/2018	80	7.46				
05/07/2018	20	7.35				
07/17/2018	**17000**	3.99	**537**	6	1.17E+11	4.34E+10
07/25/2018	130	4.71				
08/06/2018	70	8.51				
09/05/2018	40	3.31	40	6	9.35E+09	4.67E+10
09/27/2018	40	11.96				
10/01/2018	40	5.19				
10/04/2018	40	4.23				
11/08/2018	110	12.55				
12/05/2018	130	14.89	426	65	1.05E+12	2.46E+12
12/10/2018	2200	172.36				
12/12/2018	230	51.24				
12/20/2018	500	21.11				

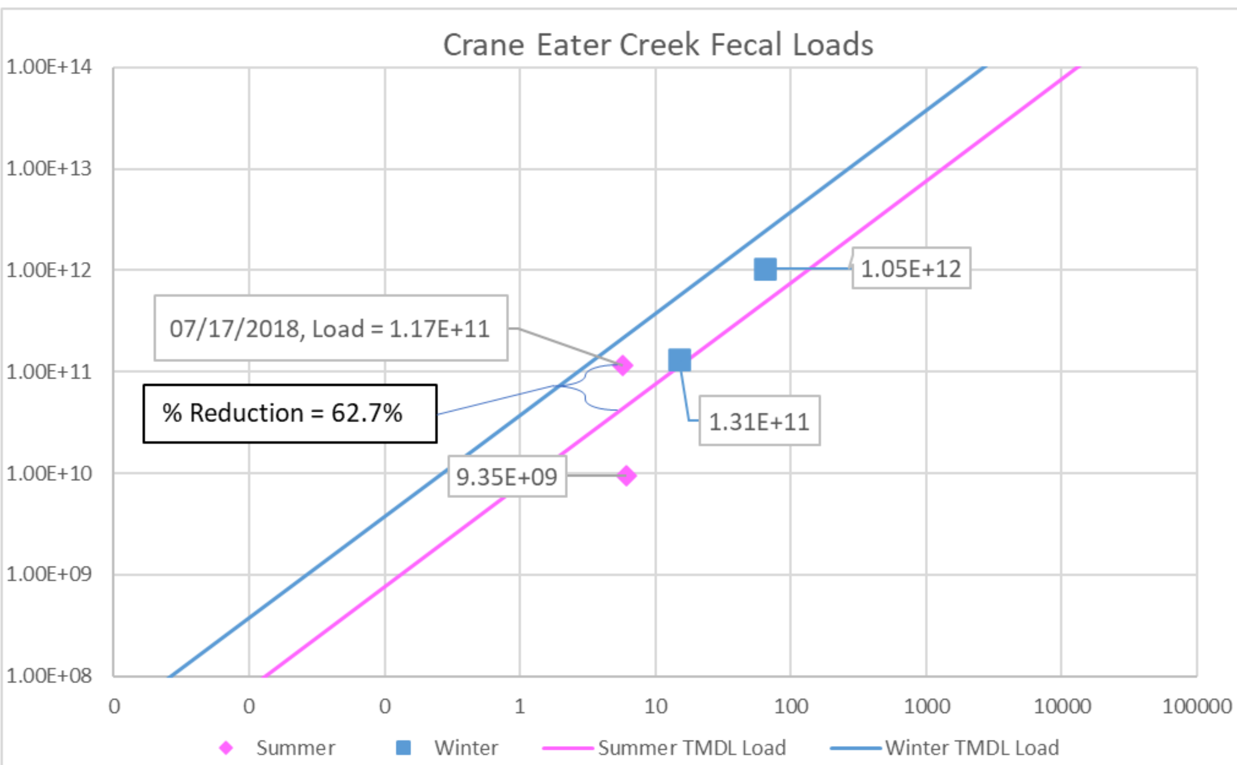

Figure A-3: Crane Eater Creek Fecal Coliform Geometric Mean Loads and Summer and Winter TMDL Curves for both Sampling Stations

Table A-6: RV_14_5142 – Dead Mans Branch @ Corinth Rd
Water Quality Monitoring Data

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
02/04/2019	130	2.62	459	5	7.92E+10	1.73E+11
02/07/2019	170	2.50				
02/12/2019	**50000**	6.09				
02/27/2019	40	7.03				
06/05/2019	80	1.32	**670**	1	3.17E+10	9.45E+09
06/10/2019	**50000**	1.61				
06/24/2019	360	1.06				
06/26/2019	140	1.01				
07/08/2019	800	0.83	**490**	1	1.56E+10	6.38E+09
07/11/2019	800	0.87				
07/15/2019	300	0.88				
07/22/2019	300	0.79				
10/07/2019	80	0.50	**317**	3	3.39E+10	2.14E+10
10/09/2019	20	0.49				
10/28/2019	700	2.75				
10/31/2019	**9000**	7.57				

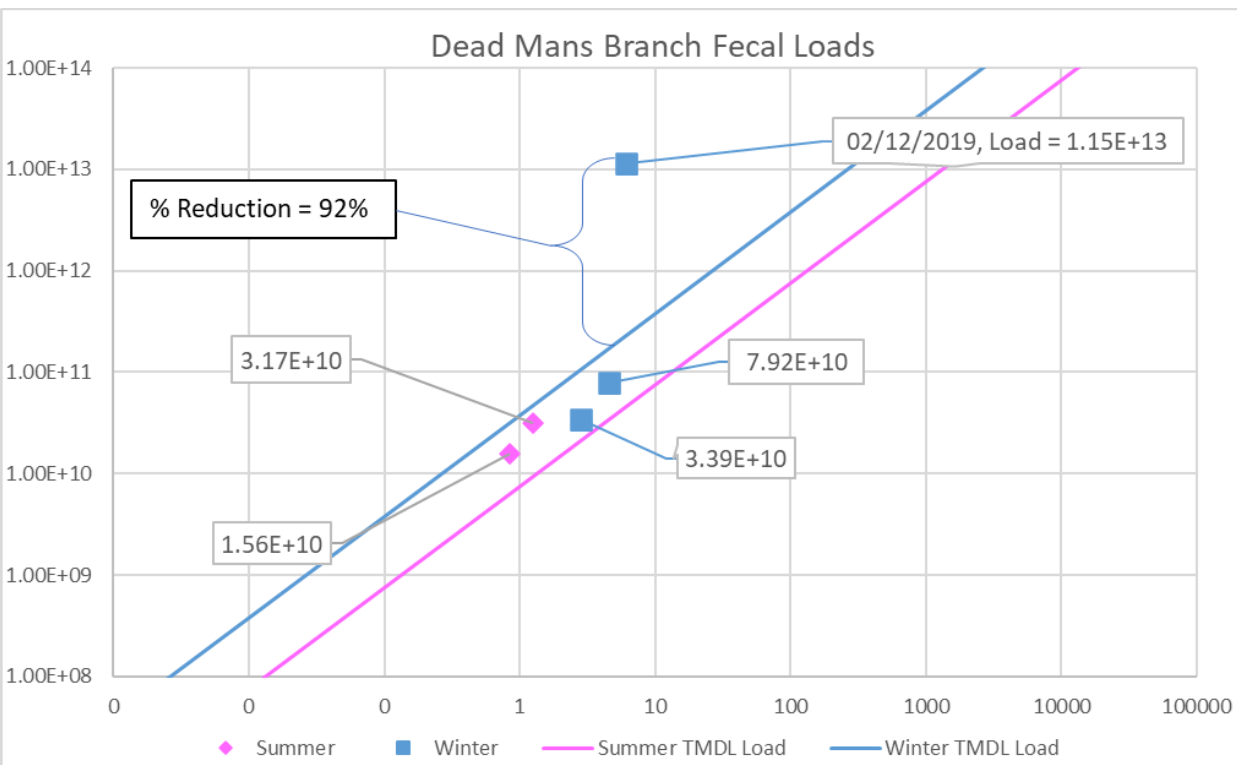

Figure A-4: Dead Mans Branch Fecal Coliform Geometric Mean Loads and Summer and Winter TMDL Curves for both Sampling Stations

Table A-7: RV_14_4813 – Armuchee East Fork Creek near Smith Lane, near LaFayette, GA Water Quality Monitoring Data

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
01/13/2021	10	45.69	12	47	2.10E+10	1.76E+12
01/20/2021	10	27.61				
02/02/2021	20	64.94				
02/09/2021	10	48.22				
05/24/2021	800	22.55	**528**	22	4.34E+11	1.65E+11
06/03/2021	230	17.17				
06/07/2021	800	25.47				

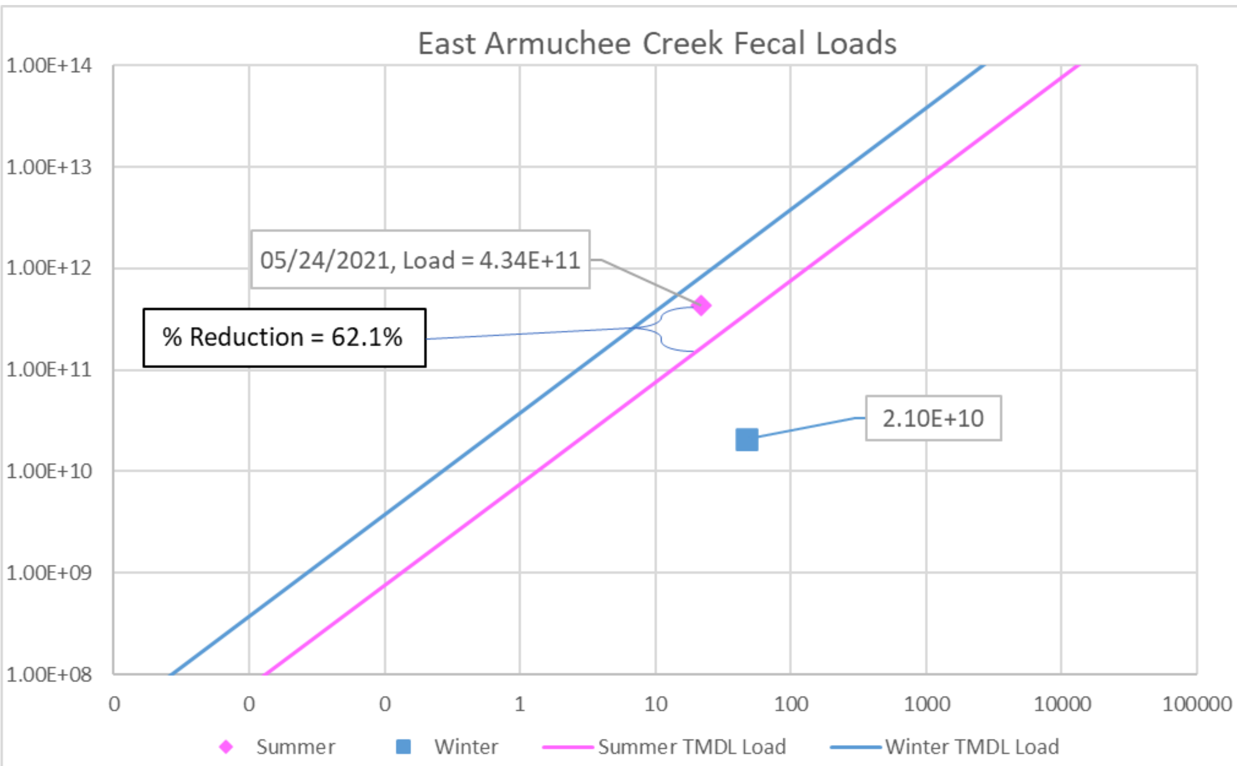

Figure A-5: East Armuchee Creek Fecal Coliform Geometric Mean Loads and Summer and Winter TMDL Curves for both Sampling Stations

Table A-8: RV_14_17574 – Etowah River at Eagles Beak Park near Hightower, GA Water Quality Monitoring Data

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
01/22/2019	40	1389.87	71	1658	4.46E+12	6.28E+13
01/24/2019	800	2451.43				
01/28/2019	20	1313.27				
02/14/2019	40	1477.43				
05/01/2019	70	1280.44	56	1196	2.51E+12	9.05E+12
05/07/2019	40	1225.72				
05/09/2019	20	1171.00				
05/16/2019	170	1105.33				
08/05/2019	230	501.23	**261**	439	4.34E+12	3.32E+12
08/15/2019	110	409.30				
08/20/2019	800	366.62				
08/28/2019	230	479.34				
11/13/2019	80	413.68	124	484	2.27E+12	1.83E+13
11/25/2019	500	549.38				
12/03/2019	230	609.57				
12/05/2019	40	462.93				
12/09/2019	80	384.13				

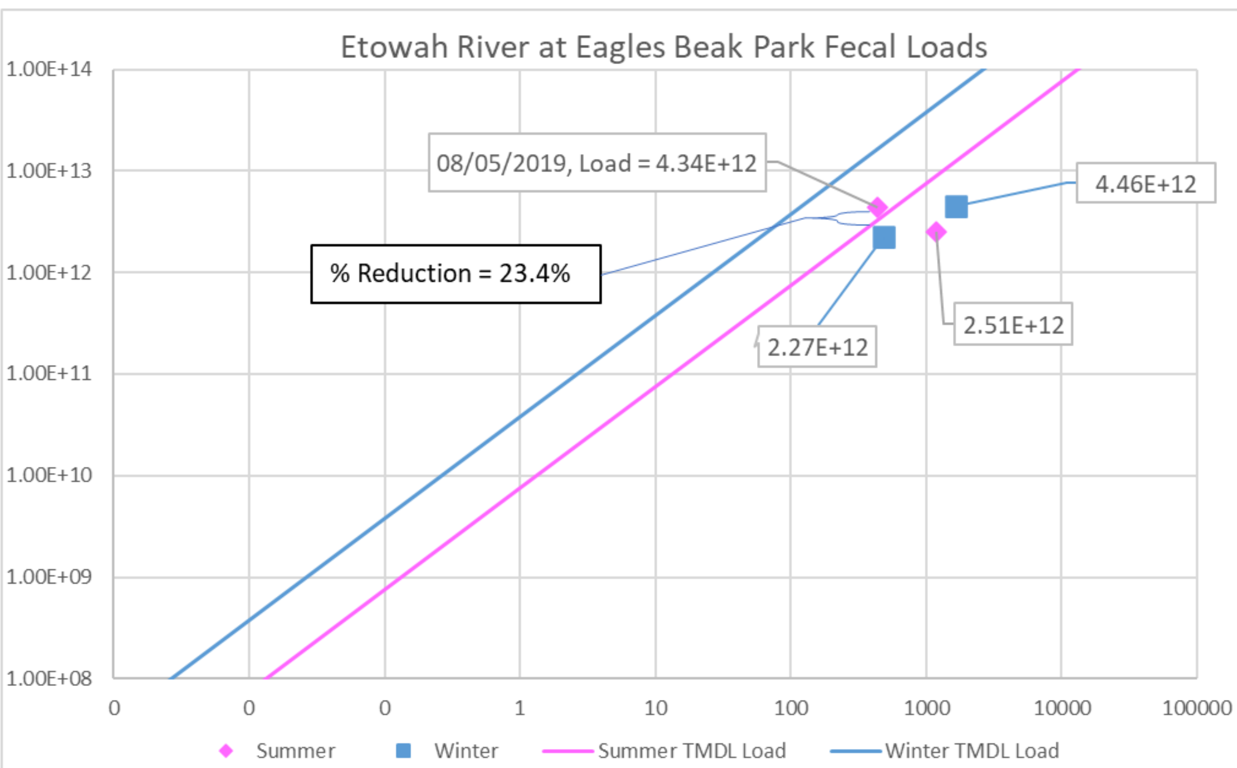

Figure A-6: Etowah River Fecal Coliform Geometric Mean Loads and Summer and Winter TMDL Curves for both Sampling Stations

Table A-9: RV_14_16423 – Etowah River at Kelly Bridge Road near Silver City, GA Water Quality Monitoring Data

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
01/22/2019	20	1294.91	54	1545	3.18E+12	5.85E+13
01/24/2019	800	2283.94				
01/28/2019	10	1223.54				
02/14/2019	55	1376.48				
05/01/2019	80	1192.95	67	1114	2.84E+12	8.43E+12
05/07/2019	40	1141.97				
05/09/2019	80	1090.99				
05/16/2019	80	1029.81				
08/05/2019	70	466.98	**284**	409	4.40E+12	3.10E+12
08/15/2019	170	381.34				
08/20/2019	1100	341.57				
08/28/2019	500	446.59				
11/13/2019	10	385.42	72	451	1.24E+12	1.71E+13
11/25/2019	500	511.85				
12/03/2019	500	567.93				
12/05/2019	40	431.30				
12/09/2019	20	357.89				

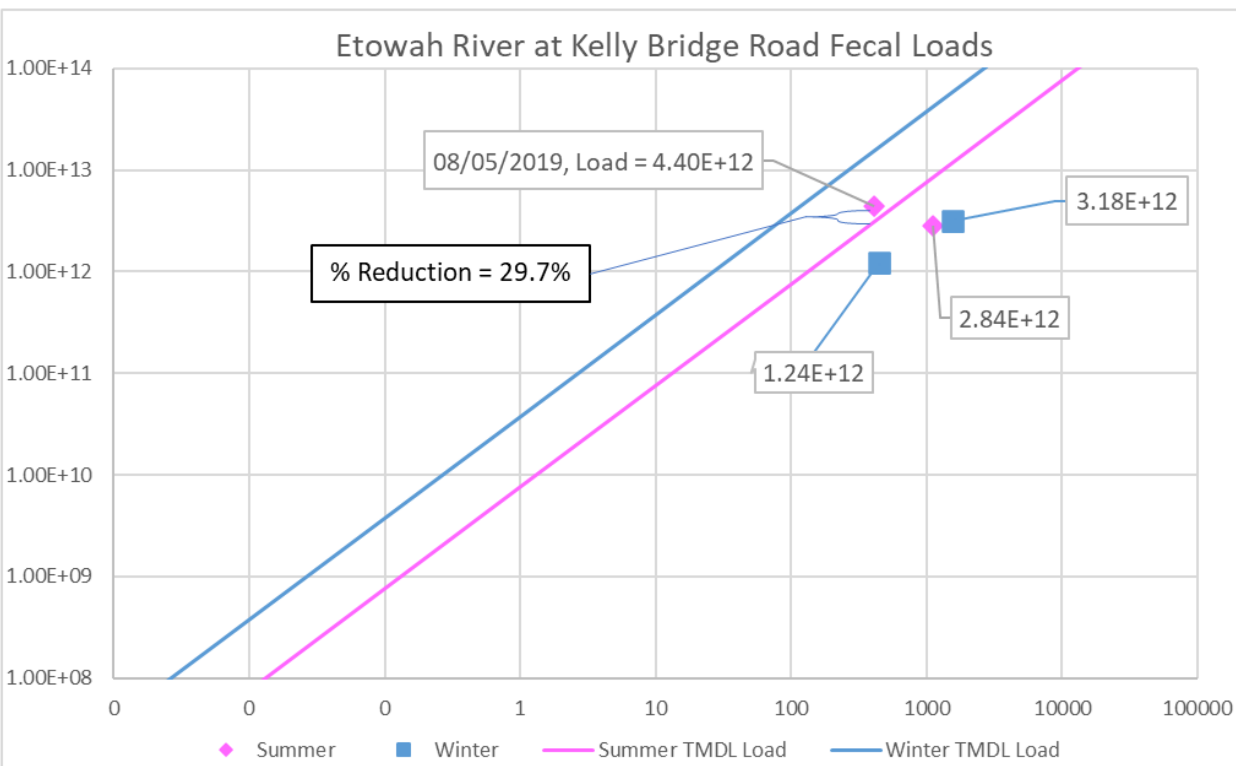

Figure A-7: Etowah River Fecal Coliform Geometric Mean Loads and Summer and Winter TMDL Curves

Table A-10: RV_14_16353 – Euharlee Creek at Wayside Park Rockmart Water Quality Monitoring Data

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
01/20/2016	20	57.32	112	138	5.85E+11	5.24E+12
01/27/2016	130	95.78				
02/03/2016	3000	333.98				
02/09/2016	20	66.47				
05/10/2016	500	20.04	408	20	3.05E+11	1.50E+11
05/12/2016	300	19.28				
06/07/2016	800	24.13				
06/09/2016	230	15.62				
08/15/2016	130	11.10	437	8	1.36E+11	6.23E+10
08/29/2016	700	7.63				
09/01/2016	500	7.71				
09/06/2016	800	6.45				
11/01/2016	40	6.36	83	6	2.03E+10	2.44E+11
11/08/2016	40	6.27				
11/15/2016	230	6.47				
11/22/2016	130	6.71				

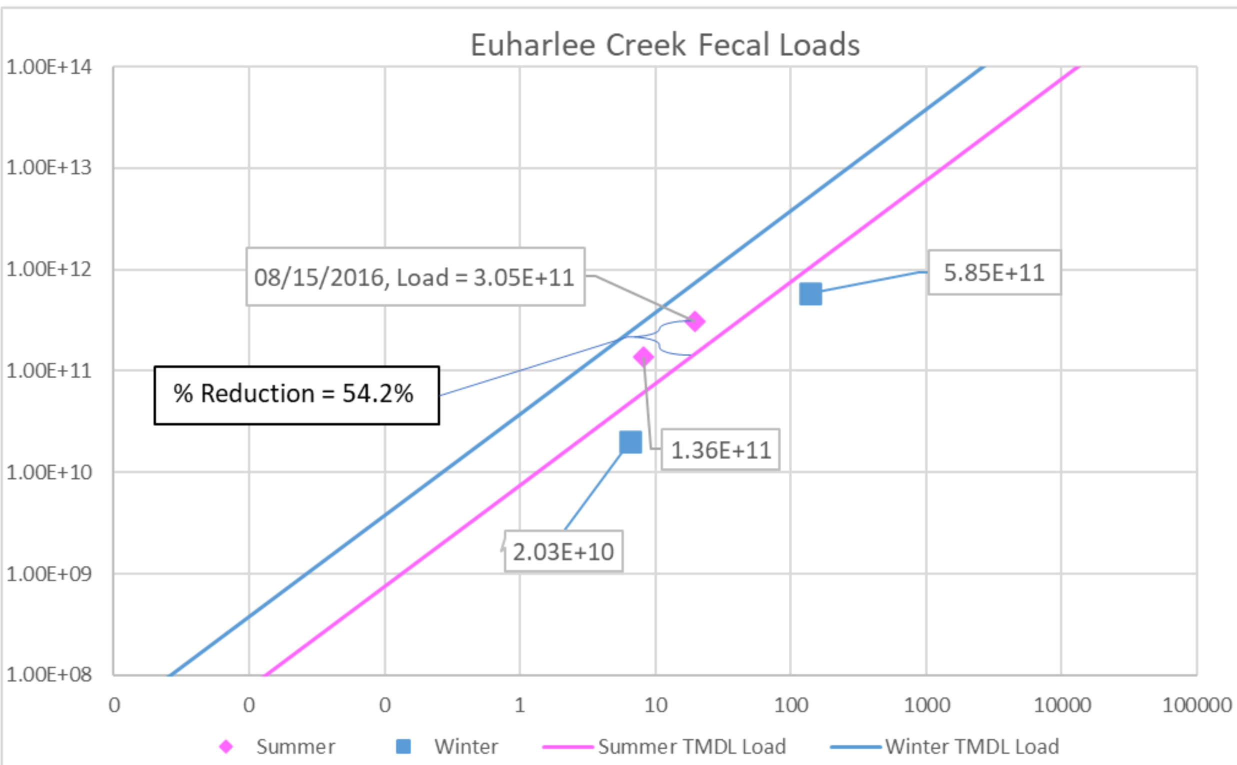

Figure A-8: Euharlee Creek Fecal Coliform Geometric Mean Loads and Summer and Winter TMDL Curves

Table A-11: RV_14_4831 – Flat Creek at SR 382, near Ellijay, GA Water Quality Monitoring Data

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
02/15/2017	500	5.12	261	4	4.38E+10	1.68E+11
02/27/2017	170	2.94				
03/06/2017	110	2.98				
03/14/2017	500	6.68				
05/31/2017	700	14.64	**612**	11	2.62E+11	8.57E+10
06/08/2017	500	11.01				
06/12/2017	800	5.84				
06/19/2017	500	13.76				
09/27/2017	220	3.13	152	4	2.32E+10	3.06E+10
10/05/2017	170	2.43				
10/11/2017	110	4.94				
10/26/2017	130	5.65				
11/20/2017	130	5.25	77	5	1.60E+10	2.08E+11
11/28/2017	170	4.37				
12/12/2017	80	6.62				
12/19/2017	20	5.72				

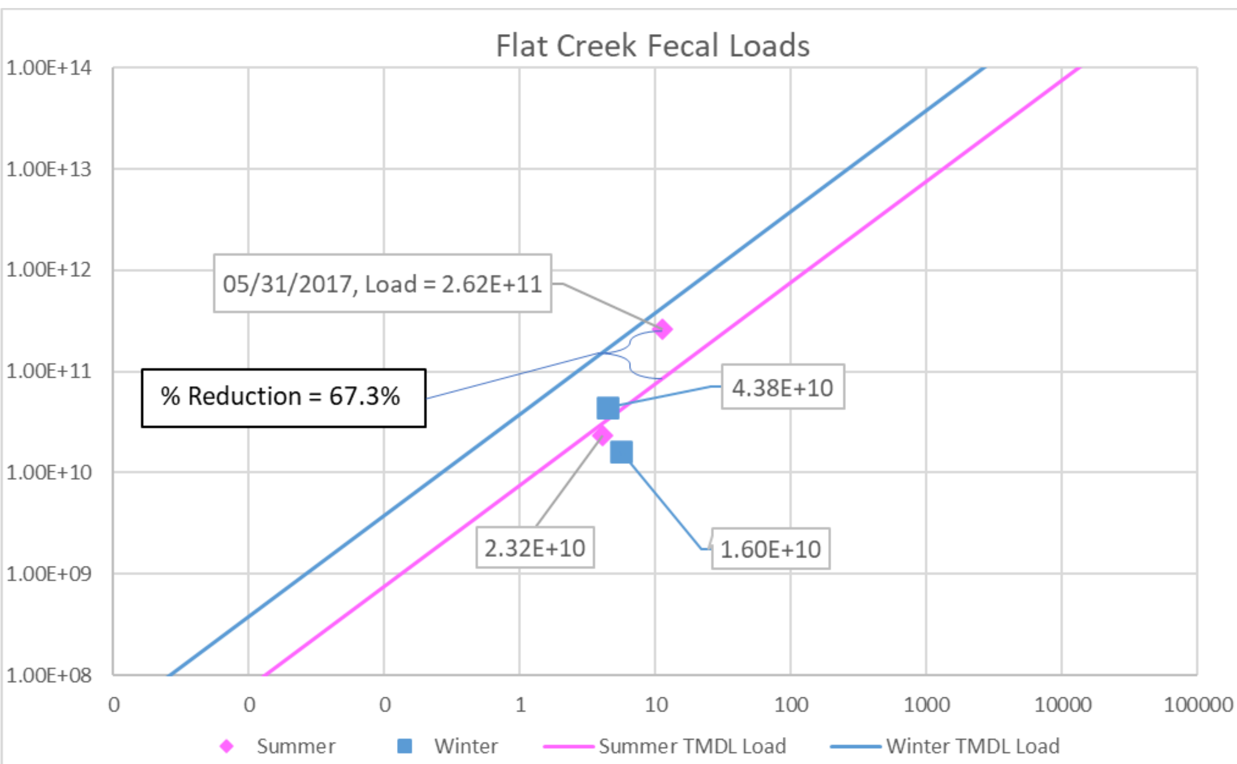

Figure A-9: Flat Creek Fecal Coliform Geometric Mean Loads and Summer and Winter TMDL Curves

Table A-12: RV_14_17277 – Fuller Branch at Riddle Mill Rd near Fairmount, GA Water Quality Monitoring Data

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
03/12/2018	800	6.19	452	4	7.12E+10	1.58E+11
03/19/2018	1300	3.77				
04/04/2018	80	3.62				
04/10/2018	500	3.07				
07/17/2018	750	16.65	**311**	7	8.21E+10	5.28E+10
07/25/2018	500	2.28				
08/06/2018	80	2.01				
09/05/2018	300	0.78	**378**	1	1.44E+10	7.61E+09
09/27/2018	800	1.46				
10/01/2018	170	0.95				
10/04/2018	500	0.82				
12/05/2018	300	2.92	541	5	1.12E+11	2.07E+11
12/10/2018	500	10.45				
12/12/2018	520	5.01				
12/20/2018	1100	3.53				

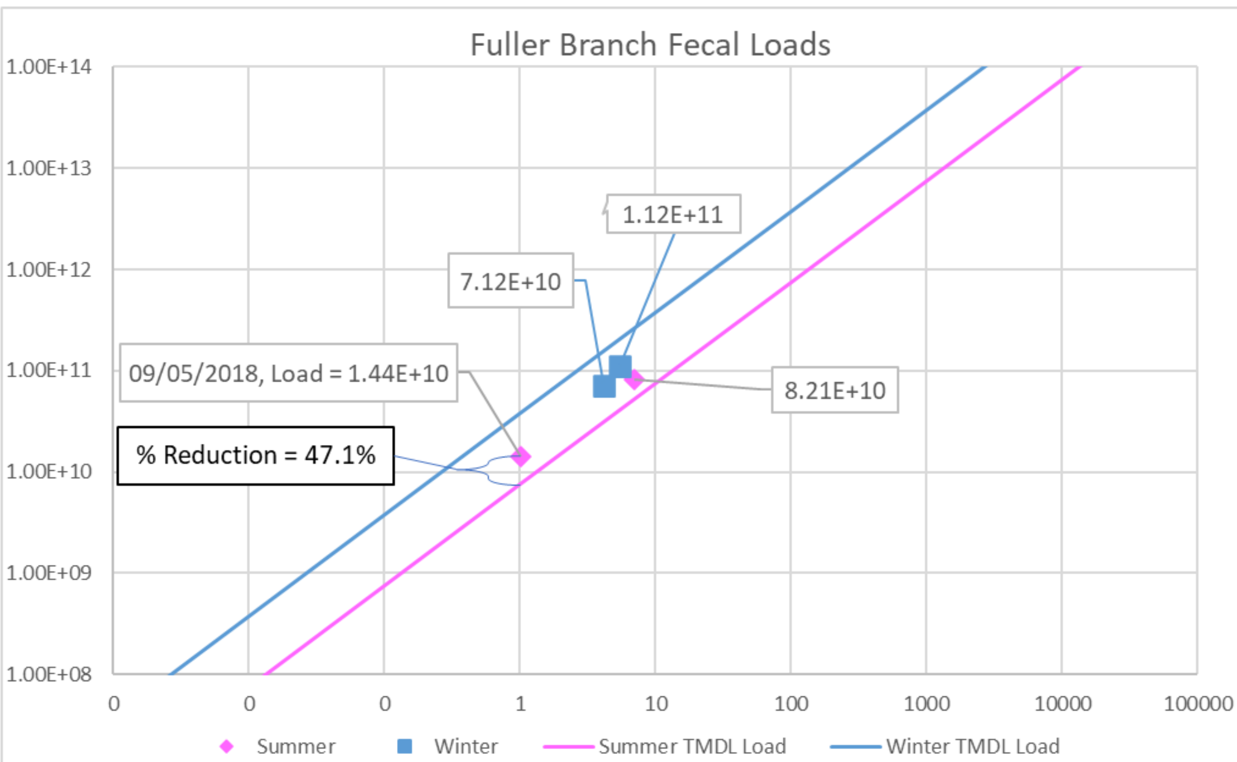

Figure A-10: Fuller Branch Fecal Coliform Geometric Mean Loads and Summer and Winter TMDL Curves

Table A-13: RV_14_16355 – Ketchum Branch at Underwood Road near Dalton, GA Water Quality Monitoring Data

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
01/25/2016	80	1.31	40	1	1.72E+09	4.30E+10
01/28/2016	20	1.14				
02/11/2016	40	0.96				
06/22/2016	300	0.28	**441**	0.3	5.17E+09	2.34E+09
06/28/2016	2200	0.49				
07/05/2016	250	0.22				
07/14/2016	230	0.24				
09/14/2016	500	0.34	**564**	0.3	5.45E+09	1.93E+09
09/29/2016	230	0.22				
10/05/2016	1100	0.23				
10/12/2016	800	0.23				
12/07/2016	3000	0.48	**1663**	0.4	2.41E+10	1.45E+10
12/12/2016	3000	0.34				
12/14/2016	1700	0.33				
12/20/2016	500	0.38				

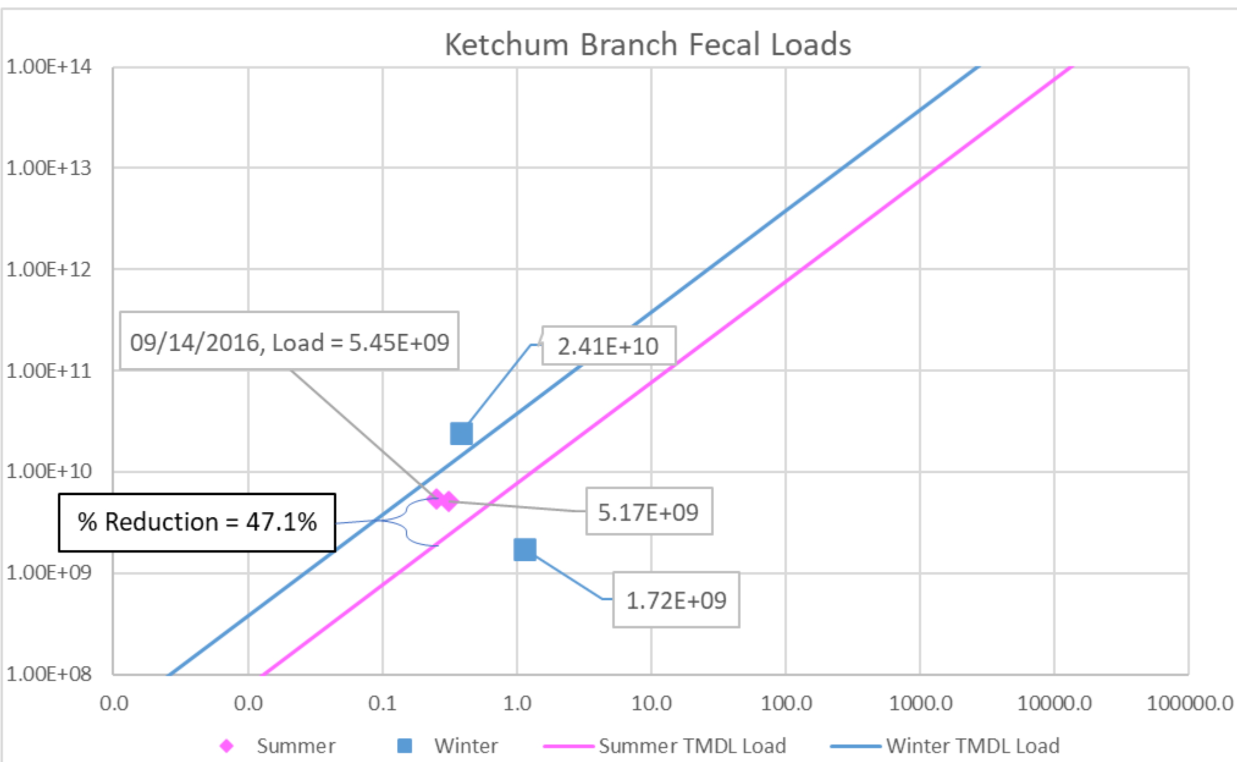

Figure A-11: Ketchum Branch Fecal Coliform Geometric Mean Loads and Summer and Winter TMDL Curves

Table A-14: RV_14_4841 – Lick Creek near Langford Road NE, Fairmount, GA Water Quality Monitoring Data

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
02/08/2017	170	10.02	47	8	1.49E+10	3.18E+11
02/27/2017	20	7.02				
03/06/2017	30	8.20				
05/31/2017	260	27.18	**366**	31	4.33E+11	2.37E+11
06/06/2017	2300	65.89				
06/12/2017	230	15.42				
06/19/2017	130	16.75				
09/27/2017	300	9.37	**267**	22	2.26E+11	1.69E+11
10/05/2017	20	7.55				
10/11/2017	170	14.19				
10/23/2017	**5000**	58.30				
11/20/2017	300	12.64	138	12	6.21E+10	4.51E+11
11/28/2017	230	10.51				
12/05/2017	40	11.39				
12/19/2017	130	13.16				

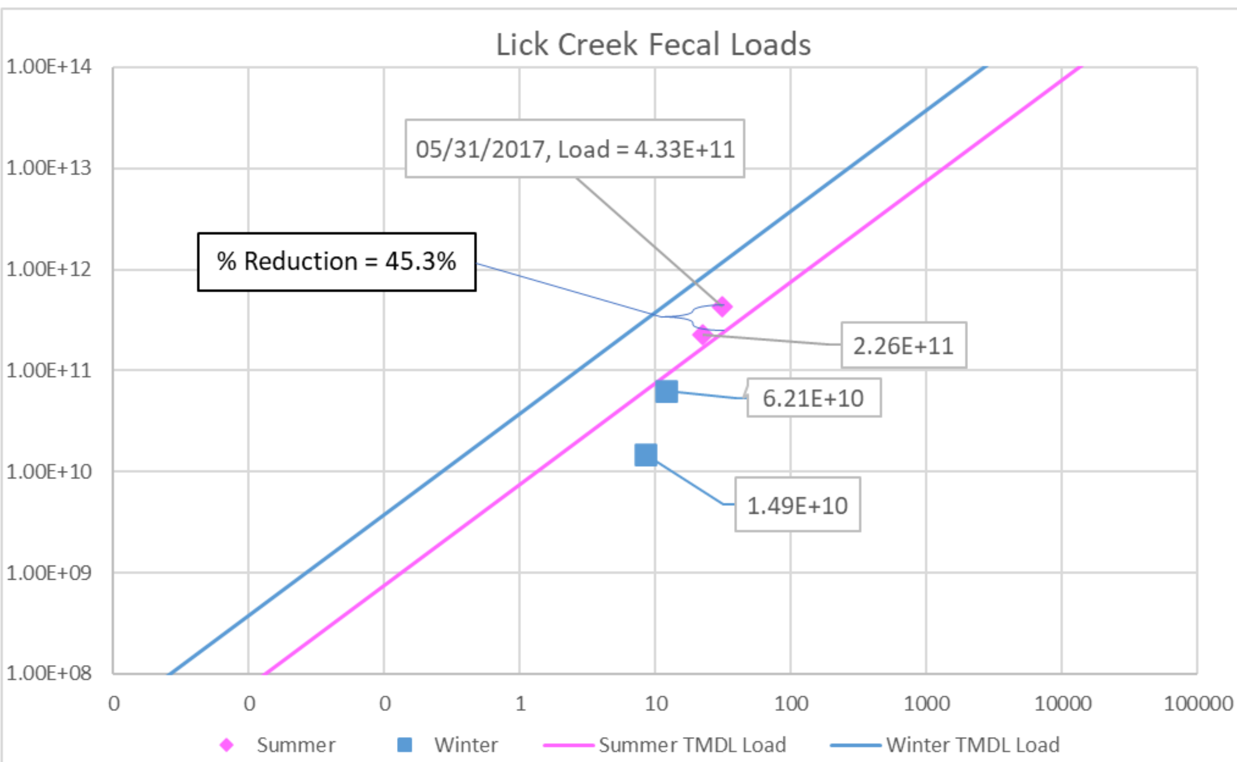

Figure A-12: Lick Creek Fecal Coliform Geometric Mean Loads and Summer and Winter TMDL Curves

Table A-15: RV_14_16360 – Mill Creek @ SR 3 Bypass Water Quality Monitoring Data

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
01/25/2016	500	58.58	210	51	4.04E+11	1.93E+12
01/28/2016	230	51.35				
02/11/2016	80	42.99				
06/22/2016	600	12.66	**385**	14	2.02E+11	1.05E+11
06/28/2016	800	21.89				
07/05/2016	170	10.01				
07/14/2016	270	10.94				
09/14/2016	1300	15.23	**401**	11	1.74E+11	8.66E+10
09/29/2016	220	9.80				
10/05/2016	300	10.37				
10/12/2016	300	10.37				
12/07/2016	400	21.39	276	17	1.79E+11	6.49E+11
12/12/2016	230	15.16				
12/14/2016	210	14.95				
12/20/2016	300	17.09				

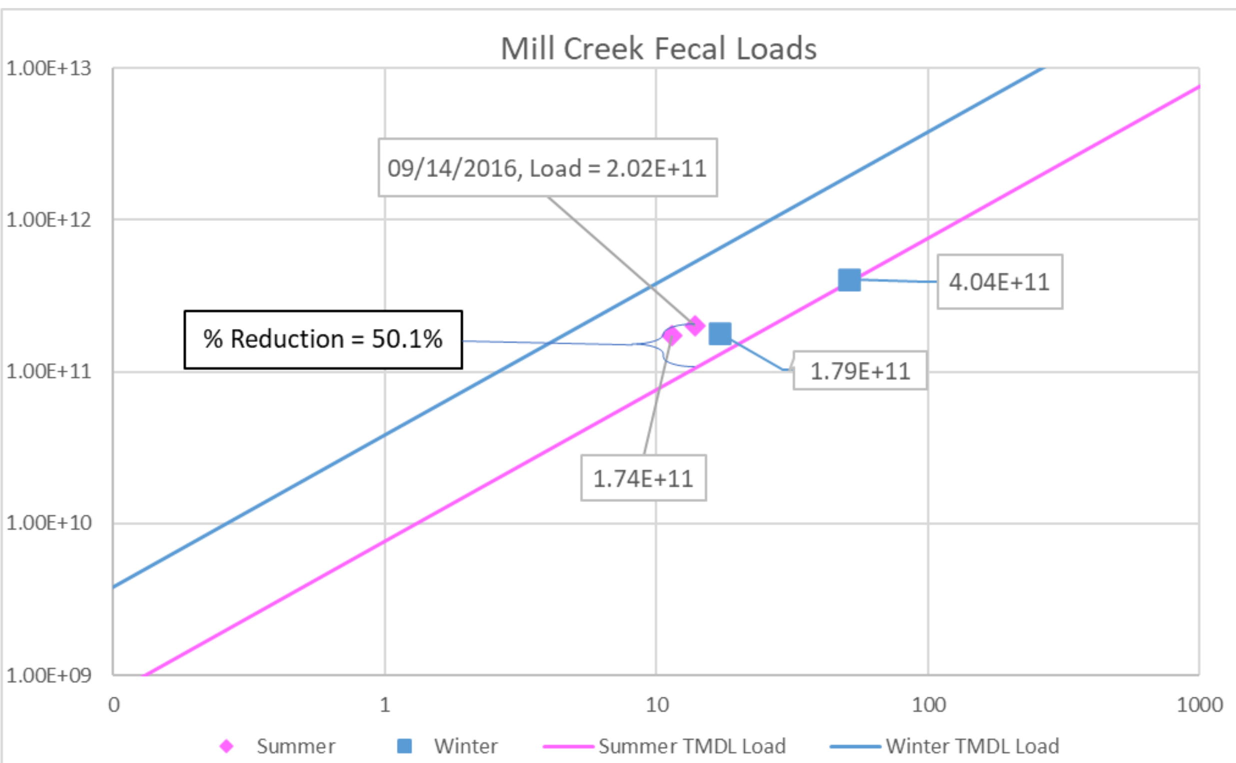

Figure A-13: Mill Creek Fecal Coliform Geometric Mean Loads and Summer and Winter TMDL Curves

Table A-16: RV_14_17806 – Moore Creek at Ammons Drive near Waleska, GA Water Quality Monitoring Data

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
01/25/2021	500	2.30	69	3	8.37E+09	1.21E+11
01/27/2021	230	3.03				
02/10/2021	10	2.57				
02/15/2021	20	4.88				
04/05/2021	40	6.73	28	5	5.36E+09	1.90E+11
04/19/2021	40	3.75				
04/26/2021	20	5.30				
04/28/2021	20	4.25				
07/22/2021	500	8.54	**945**	6	2.10E+11	4.44E+10
07/28/2021	1300	4.69				
08/02/2021	1300	2.71				
08/12/2021		7.53				

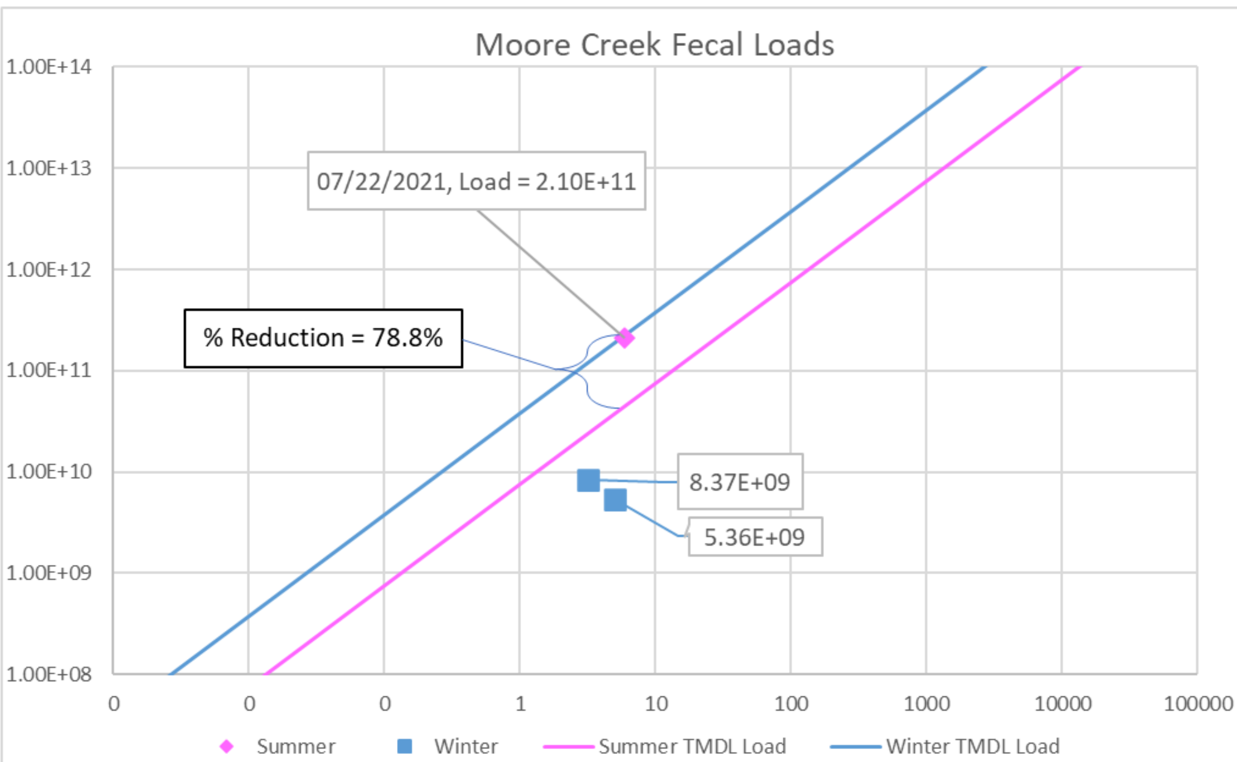

Figure A-14: Moore Creek Fecal Coliform Geometric Mean Loads and Summer and Winter TMDL Curves

Table A-17: RV_14_17477 – Ninetynine Branch at Irwin Mill Rd near Fairmount, GA Water Quality Monitoring Data

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
02/08/2017	40	2.95	109	2	1.02E+10	9.37E+10
02/27/2017	40	2.06				
03/06/2017	800	2.41				
05/31/2017	110	8.00	110	9	3.83E+10	6.98E+10
06/06/2017	300	19.39				
06/12/2017	110	4.54				
06/19/2017	40	4.93				
09/27/2017	300	2.76	**714**	7	1.78E+11	4.98E+10
10/05/2017	80	2.22				
10/11/2017	360	4.18				
10/23/2017	30000	17.16				
11/20/2017	50	3.72	50	4	6.68E+09	1.33E+11
11/28/2017	20	3.09				
12/05/2017	80	3.35				
12/19/2017	80	3.87				
01/25/2021	40	6.09	60	8	1.86E+10	3.11E+11
01/27/2021	80	8.93				
02/10/2021	40	6.09				
02/15/2021	100	11.72				
04/05/2021	70	11.39	269	8	8.38E+10	3.11E+11
04/19/2021	300	7.12				
04/26/2021	500	7.44				
04/28/2021	500	6.93				
07/22/2021	170	7.95	**224**	5	4.62E+10	4.13E+10
07/28/2021	220	5.02				
08/02/2021	300	4.10				
08/12/2021		4.74				

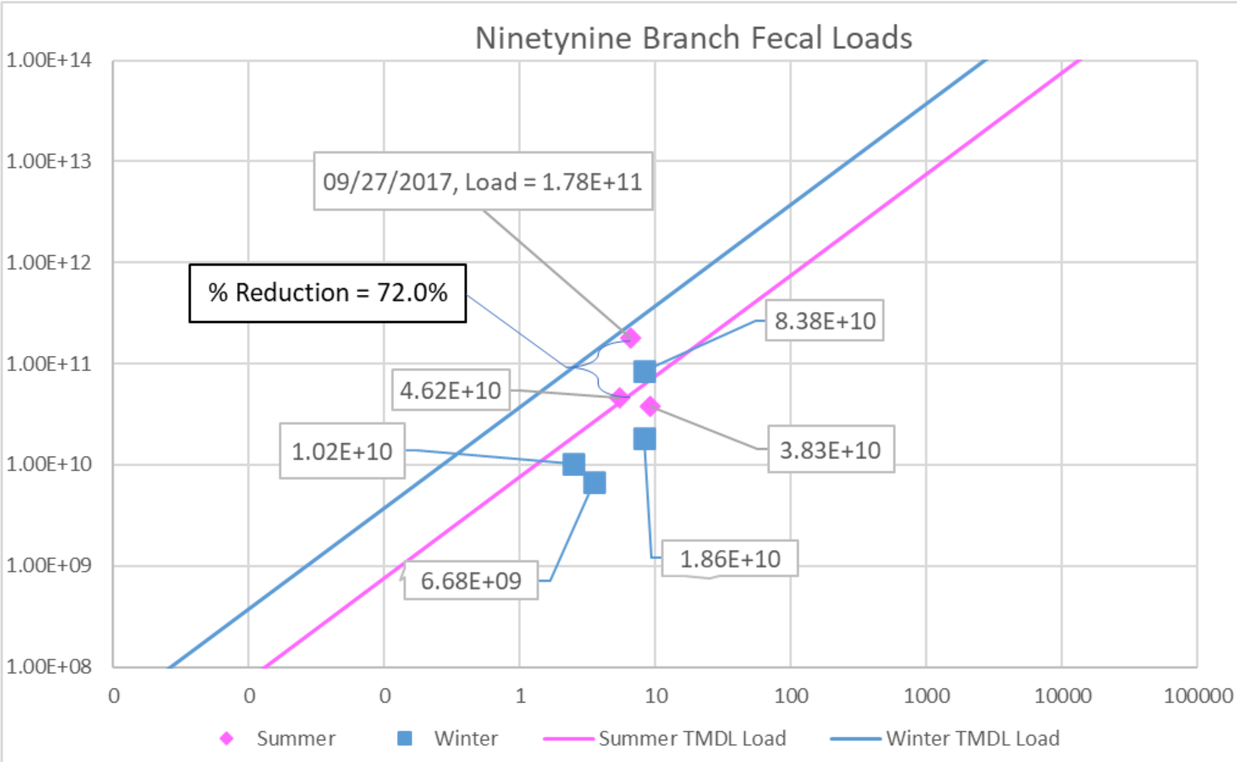

Figure A-15: Ninetynine Branch Fecal Coliform Geometric Mean Loads and Summer and Winter TMDL Curves

Table A-18: RV_14_5150 – Pettit Creek at Jones Mill Road Water Quality Monitoring Data

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
01/13/2015	40	37.71	128	29	1.41E+11	1.10E+12
01/15/2015	320	31.05				
01/21/2015	70	21.41				
02/03/2015	300	26.43				
05/14/2015	20	20.06	64	17	4.17E+10	1.30E+11
05/20/2015	40	17.65				
06/08/2015	300	15.53				
06/10/2015	70	15.53				
08/19/2015	40	12.15	106	9	3.48E+10	6.59E+10
08/25/2015	170	8.52				
08/31/2015	80	7.32				
09/15/2015	230	6.82				
11/05/2015	300	33.08	**1002**	173	6.55E+12	6.53E+12
11/09/2015	**16000**	239.18				
11/19/2015	3000	378.06				
12/01/2015	70	40.02				

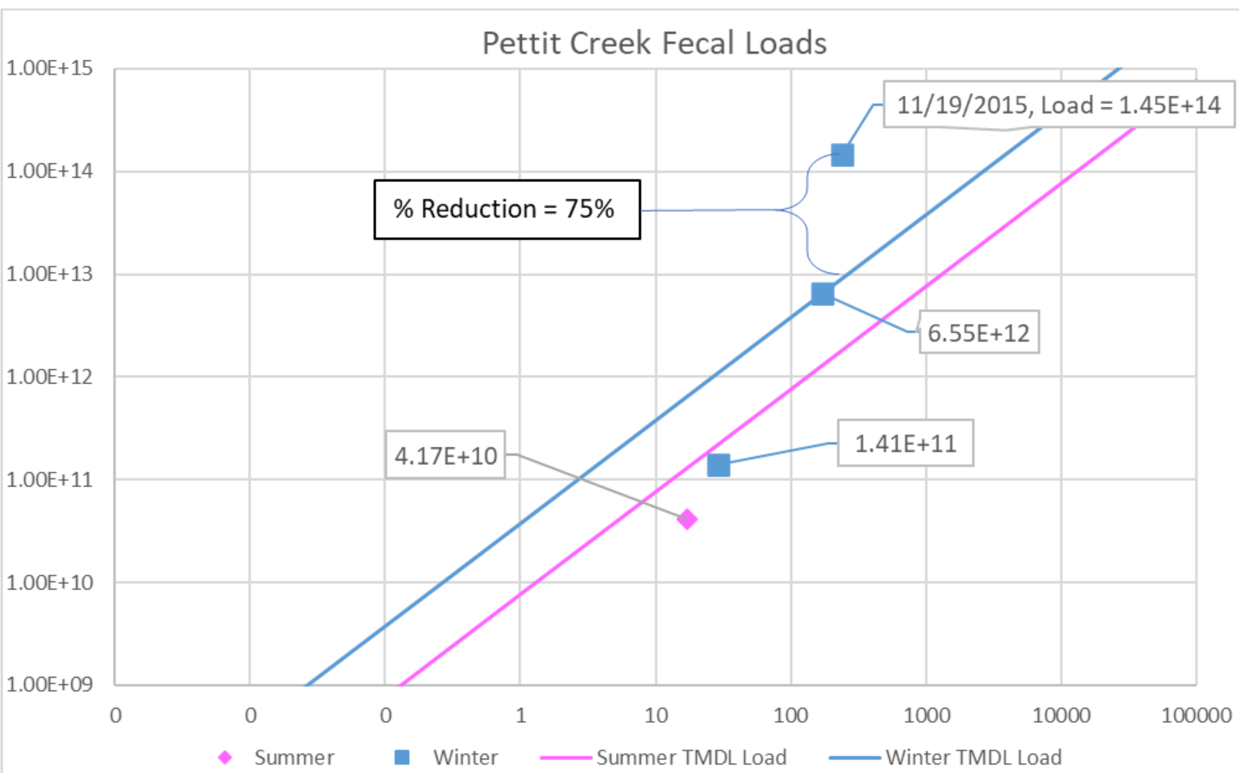

Figure A-16: Pettit Creek Fecal Coliform Geometric Mean Loads and Summer and Winter TMDL Curves

Table A-19: RV_14_17810 – Pinhook Creek at Pinhook Rd near Fairmount, GA Water Quality Monitoring Data

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
01/25/2021	170	15.32	124	22	1.03E+11	8.34E+11
01/27/2021	300	17.98				
02/10/2021	20	18.70				
02/15/2021	230	36.08				
04/05/2021	70	48.68	152	32	1.82E+11	1.20E+12
04/19/2021	110	25.04				
04/26/2021	230	27.75				
04/28/2021	300	25.04				
07/22/2021	800	23.95	**353**	16	2.15E+11	1.22E+11
07/28/2021	110	14.60				
08/02/2021	500	13.81				
08/12/2021		11.88				

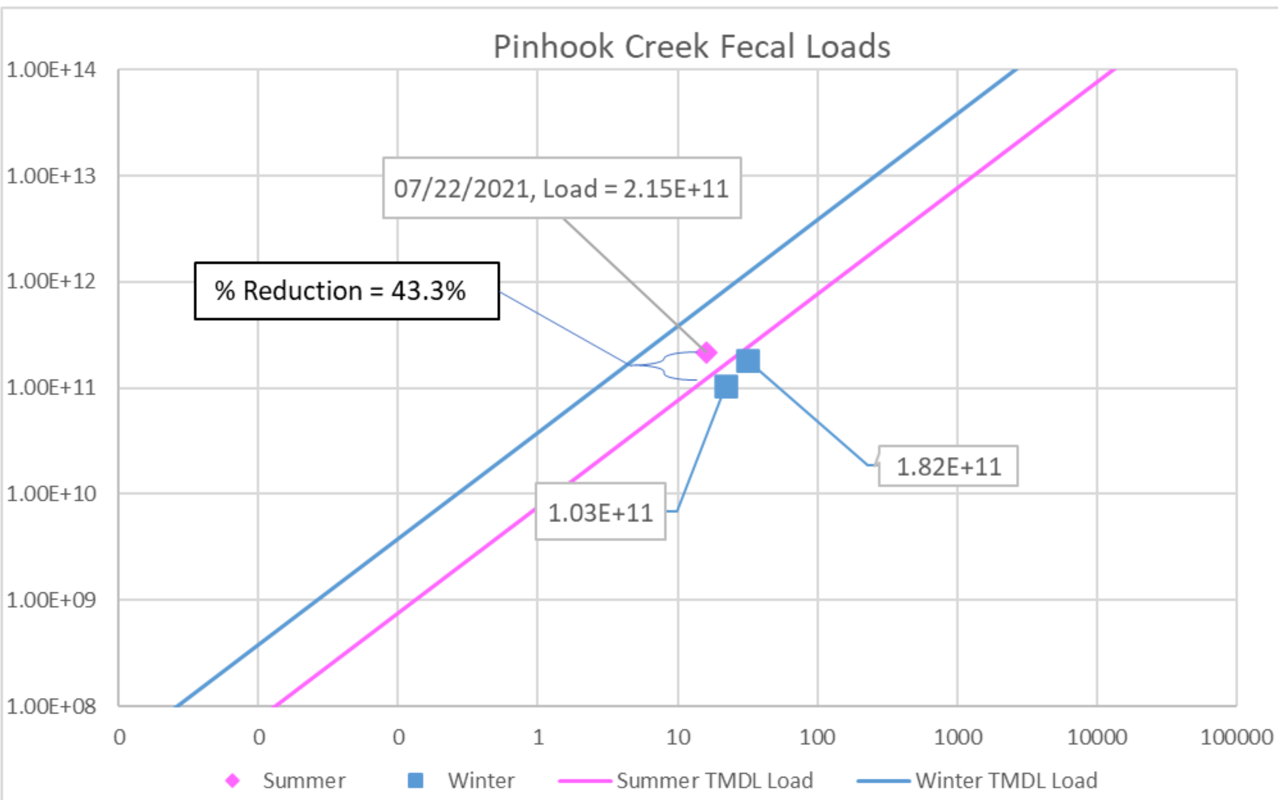

Figure A-17: Pinhook Creek Fecal Coliform Geometric Mean Loads and Summer and Winter TMDL Curves

Table A-20: RV_14_17275 – Redbud Creek at Red Bud Rd near Ranger, GA Water Quality Monitoring Data

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
03/12/2018	800	12.81	305	9	9.96E+10	1.10E+12
03/19/2018	800	7.80				
04/04/2018	80	7.49				
04/10/2018	170	6.35				
07/17/2018	5000	34.45	**766**	14	4.19E+11	1.09E+11
07/25/2018	300	4.72				
08/06/2018	300	4.15				
09/05/2018	300	1.62	**494**	2	3.88E+10	1.57E+10
09/27/2018	1800	3.03				
10/01/2018	500	1.97				
10/04/2018	220	1.70				
12/05/2018	40	6.03	165	11	7.08E+10	4.29E+11
12/10/2018	130	21.60				
12/12/2018	130	10.36				
12/20/2018	1100	7.31				

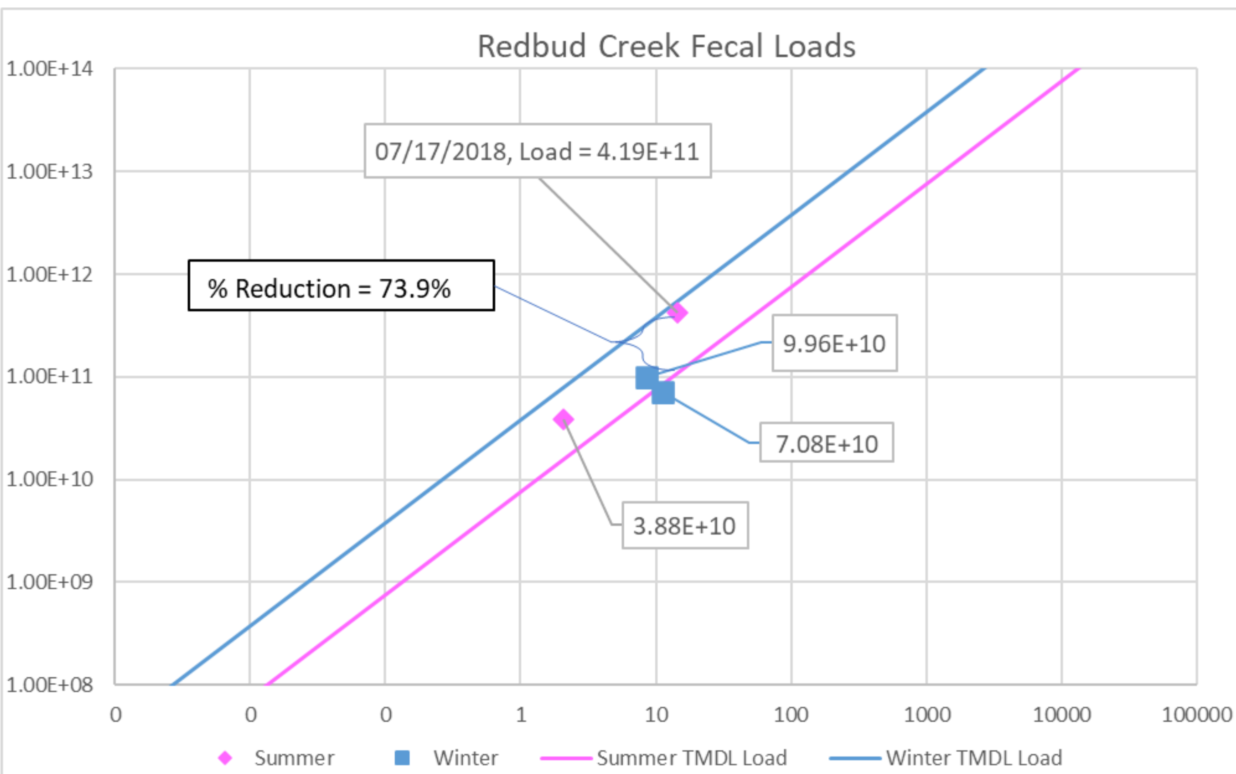

Figure A-18: Redbud Creek Fecal Coliform Geometric Mean Loads and Summer and Winter TMDL Curves

Table A-21: RV_14_16794 – Robins Creek at Miller's Ferry Road @ Tressel Water Quality Monitoring Data

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
02/14/2017	130	5.04	118	5	2.39E+10	2.02E+11
02/27/2017	40	4.22				
03/06/2017	220	4.08				
03/15/2017	170	8.04				
05/31/2017	110	6.95	181	7	5.09E+10	5.63E+10
06/07/2017	230	12.10				
06/12/2017	85	5.81				
06/19/2017	500	4.87				
09/27/2017	800	3.15	**225**	4	3.16E+10	2.81E+10
10/05/2017	170	2.48				
10/11/2017	110	5.63				
10/19/2017	170	3.59				
11/20/2017	70	3.55	55	4	7.84E+09	1.43E+11
11/28/2017	40	2.89				
12/11/2017	40	4.81				
12/19/2017	80	3.89				

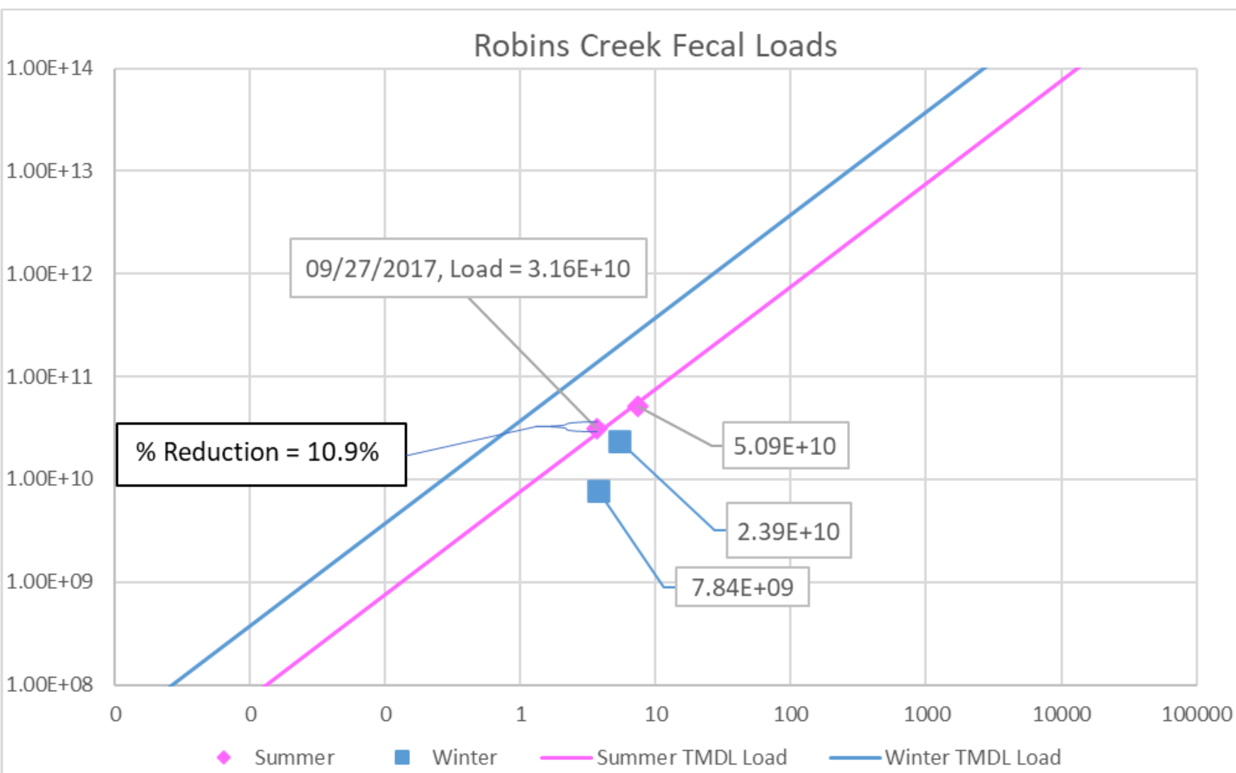

Figure A-19: Robins Creek Fecal Coliform Geometric Mean Loads and Summer and Winter TMDL Curves

Table A-22: RV_14_4869 – Simpson Creek near Jackson Rd near Rockmart, GA Water Quality Monitoring Data

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
01/16/2019	80	5.74	92	21	7.15E+10	7.80E+11
01/22/2019	20	8.58				
01/24/2019	260	58.12				
02/14/2019	170	9.99				
05/01/2019	80	5.12	169	4	2.62E+10	3.11E+10
05/07/2019	220	4.16				
05/09/2019	270	4.17				
05/21/2019	170	2.98				
08/05/2019	2300	2.67	**638**	2	4.76E+10	1.49E+10
08/08/2019	800	1.87				
08/12/2019	300	1.46				
08/28/2019	300	1.89				
11/12/2019	3000	2.16	190	2	1.45E+10	7.61E+10
11/25/2019	130	2.79				
12/03/2019	40	1.65				
12/05/2019	20	1.33				
12/11/2019	800	2.12				

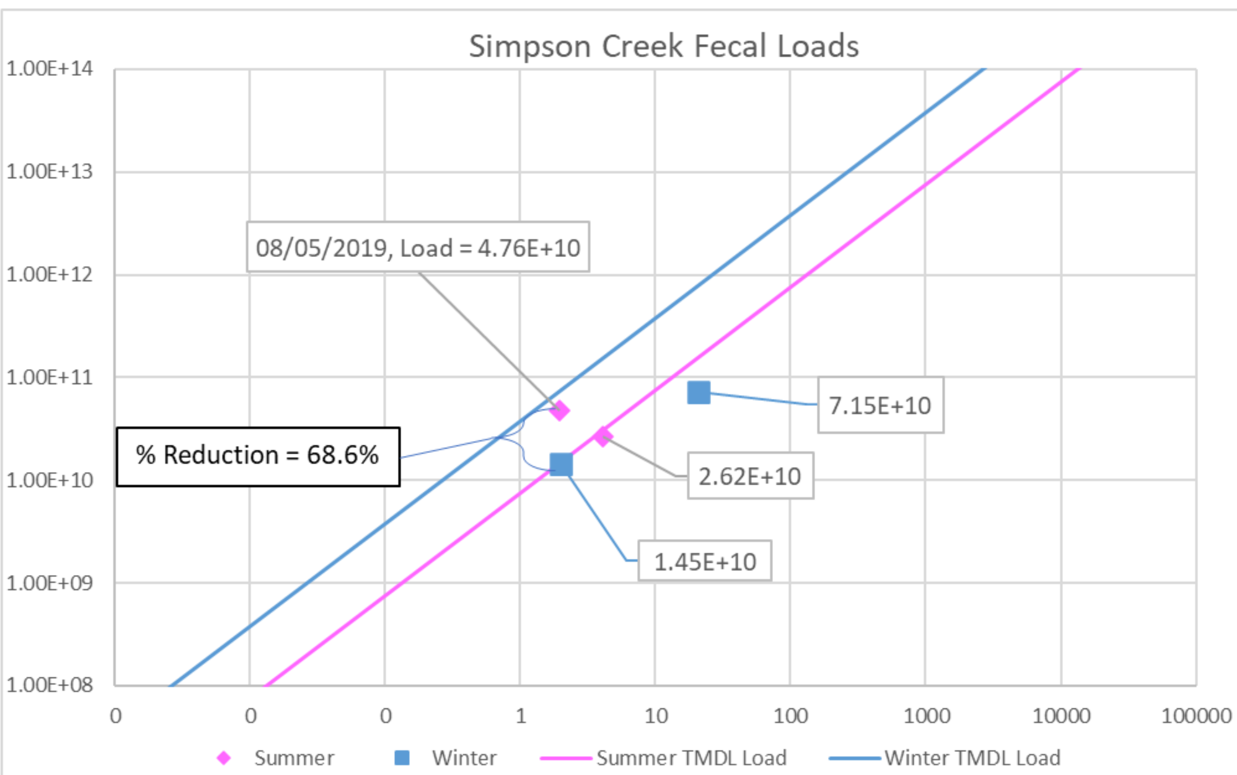

Figure A-20: Simpson Creek Fecal Coliform Geometric Mean Loads and Summer and Winter TMDL Curves

Table A-23: RV_14_4777 – Tanyard Branch at SR 100 / Canal St Water Quality Monitoring Data

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
01/20/2016	60	7.24	**1067**	19	7.59E+11	7.11E+11
01/27/2016	2400	19.28				
02/03/2016	3000	39.81				
02/09/2016	3000	8.84				
05/10/2016	2400	3.75	**3224**	4	4.69E+11	2.91E+10
05/12/2016	3000	3.66				
06/07/2016	**5000**	4.77				
06/09/2016	3000	3.20				
08/15/2016	500	1.19	**3017**	1	1.39E+11	9.20E+09
08/29/2016	**24000**	1.40				
09/01/2016	2300	1.25				
09/06/2016	3000	1.01				
11/01/2016	1700	1.00	**1210**	1	4.29E+10	3.54E+10
11/08/2016	300	0.89				
11/15/2016	**30000**	1.05				
11/22/2016	140	0.80				

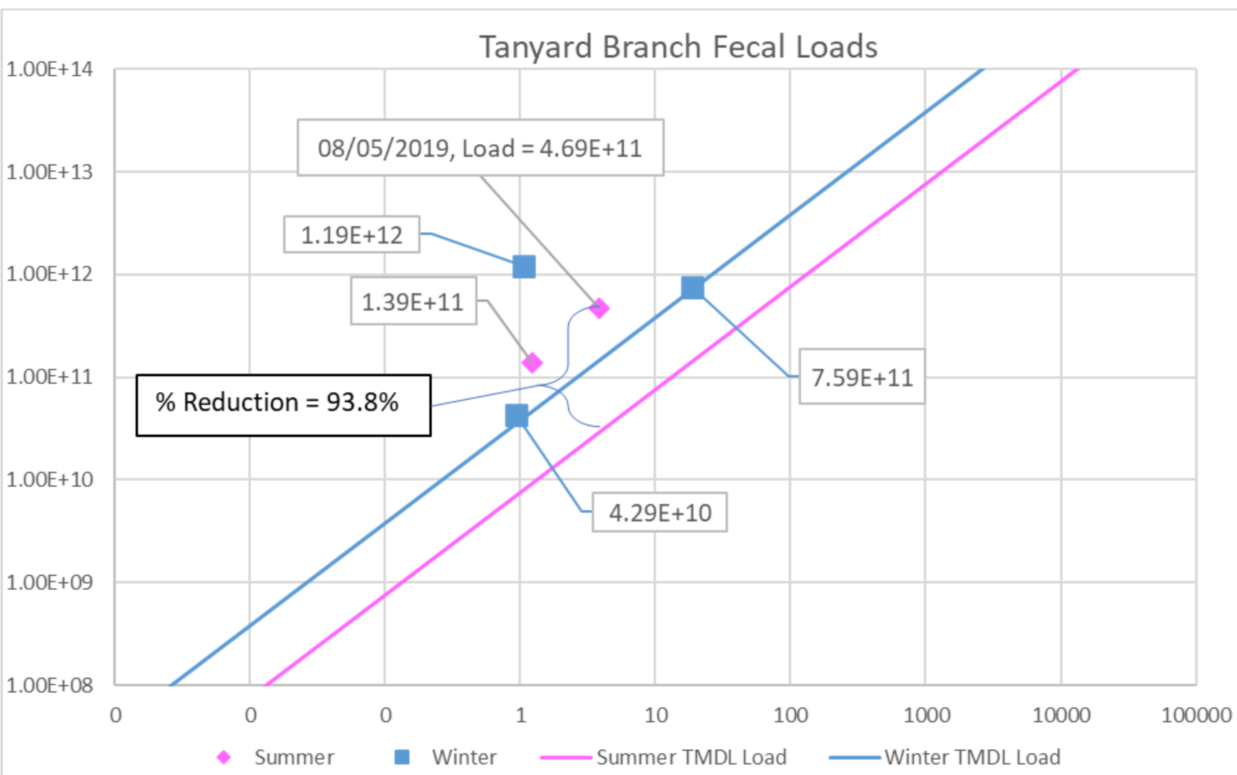

Figure A-21: Tanyard Branch Fecal Coliform Geometric Mean Loads and Summer and Winter TMDL Curves

Table A-24: RV_14_16799 – Town Creek at Newton Creek Loop near Calhoun, GA Water Quality Monitoring Data

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
03/12/2018	700	32.21	209	16	1.27E+11	6.09E+11
03/19/2018	300	13.62				
04/04/2018	130	10.44				
04/10/2018	70	8.10				
05/07/2018	230	7.98	**747**	6	1.57E+11	4.22E+10
07/17/2018	800	4.33				
07/25/2018	130	5.12				
08/06/2018	230	9.24				
09/05/2018	**13000**	3.59	**645**	7	1.64E+11	5.07E+10
09/27/2018	1100	12.99				
10/01/2018	110	5.64				
10/04/2018	110	4.60				
11/08/2018	230	13.62				
12/05/2018	300	16.17	557	70	1.49E+12	2.67E+12
12/10/2018	2000	187.14				
12/12/2018	700	55.63				
12/20/2018	230	22.92				

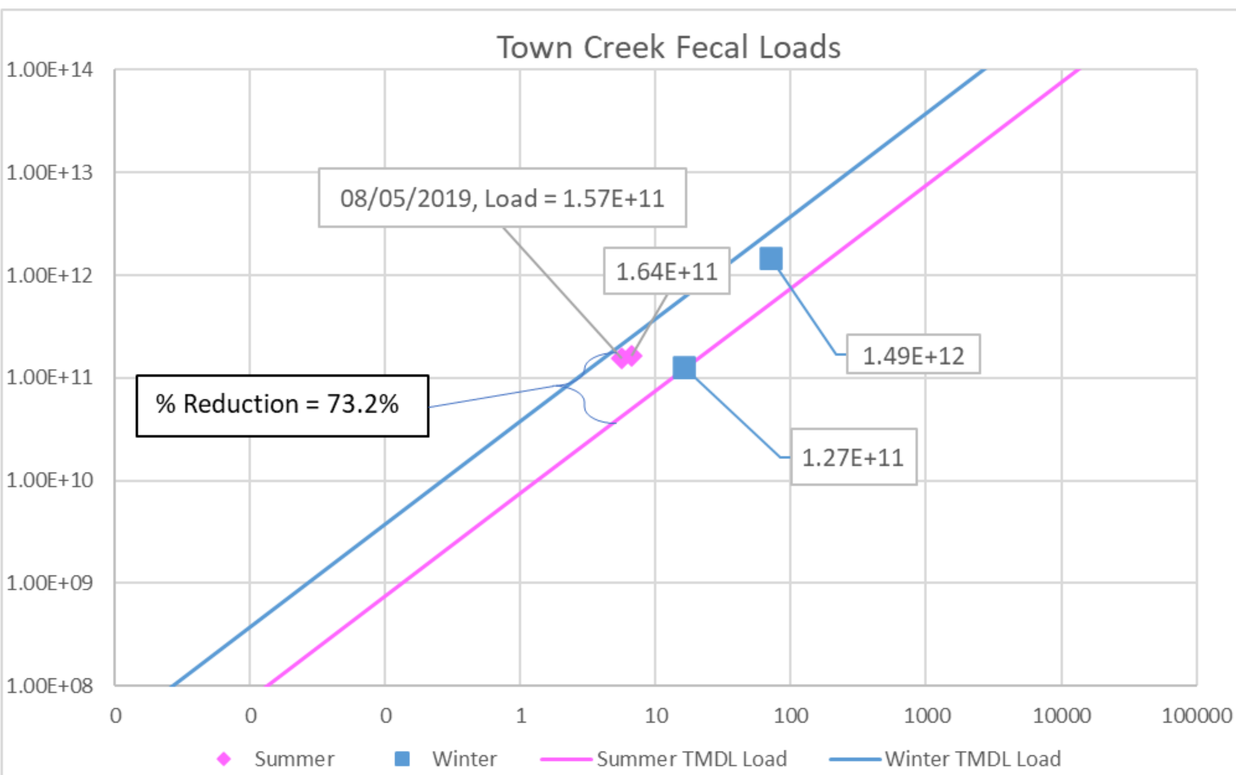

Figure A-22: Town Creek Fecal Coliform Geometric Mean Loads and Summer and Winter TMDL Curves

Appendix B

Single Sample and 30-day Geometric Mean *E. coli* Monitoring Data

Table B-1: RV_14_4480 – Bow Creek at Old Rome Dalton Road NW near Sugar Valley, GA Water Quality Monitoring Data

Date	Observed *E. coli* (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	*E. coli* Loading (counts/30 days)	TMDL *E. coli* Loading (counts/30 days)
09/19/2018	**1700**	3.39			2.18E+11	5.26E+10

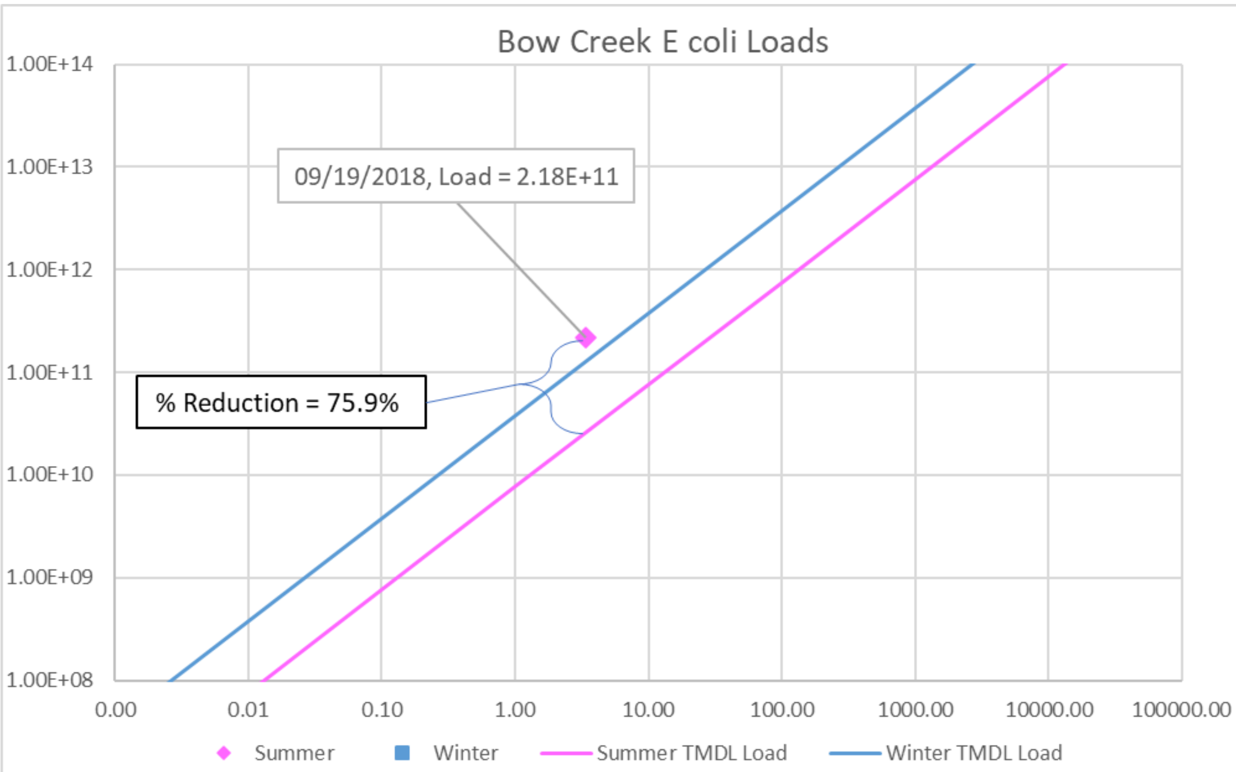

Figure B-1: Bow Creek Fecal Coliform Geometric Mean Loads and Summer and Winter TMDL Curves

Table B-2: RV_14_4823 – Crane Eater Creek at Pine Chapel Road near Calhoun, GA Water Quality Monitoring Data

Date	Observed *E. coli* (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	*E. coli* Loading (counts/30 days)	TMDL *E. coli* Loading (counts/30 days)
03/12/2018	**2200**	29.66			2.47E+12	9.67E+11
05/07/2018	20	7.35				
09/05/2018	40	3.31	25	7	6.51E+09	3.25E+10
09/27/2018	10	11.96				
10/01/2018	40	5.19				
11/08/2018	110	12.55				

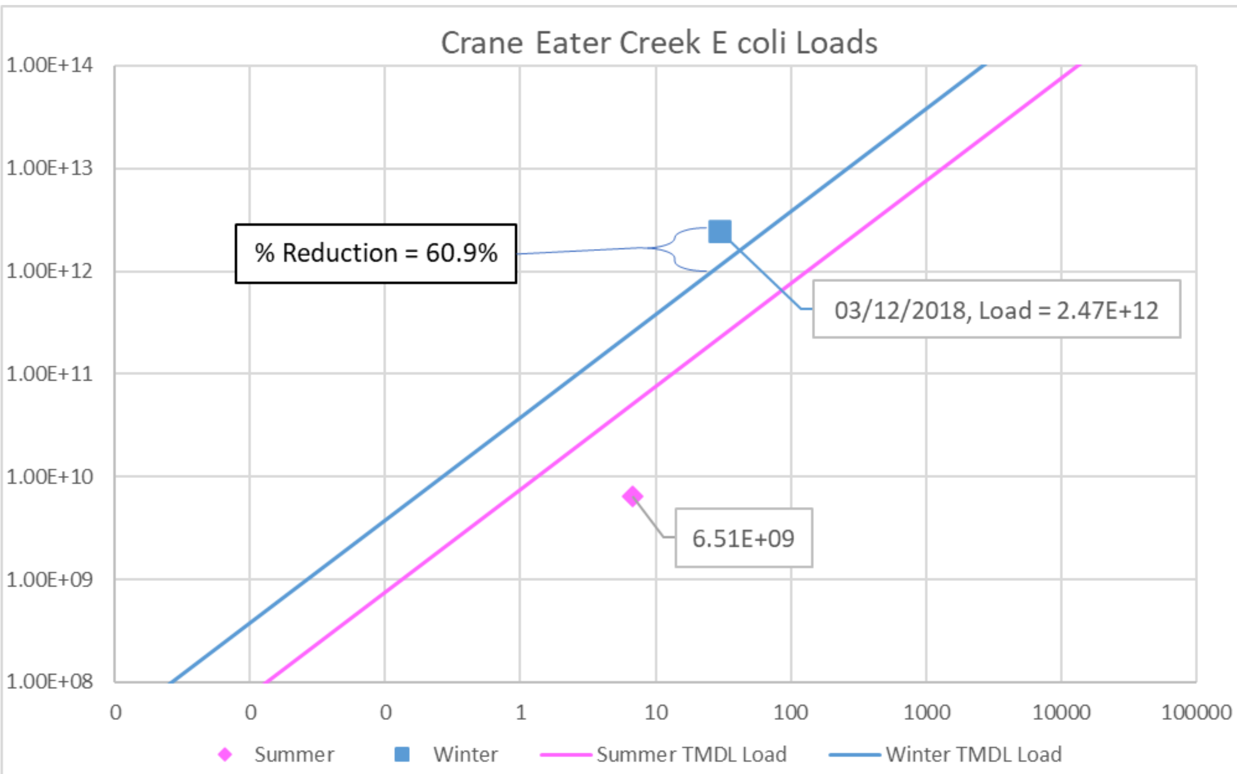

Figure B-2: Crane Eater Creek Fecal Coliform Geometric Mean Loads and Summer and Winter TMDL Curves

Table B-3: RV_14_5142 – Dead Mans Branch @ Corinth Rd
Water Quality Monitoring Data

Date	Observed *E. coli* (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	*E. coli* Loading (counts/30 days)	TMDL *E. coli* Loading (counts/30 days)
07/15/2019	300	0.88				
10/07/2019	40	0.50				
10/28/2019	**700**	2.75			7.29E+10	4.27E+10

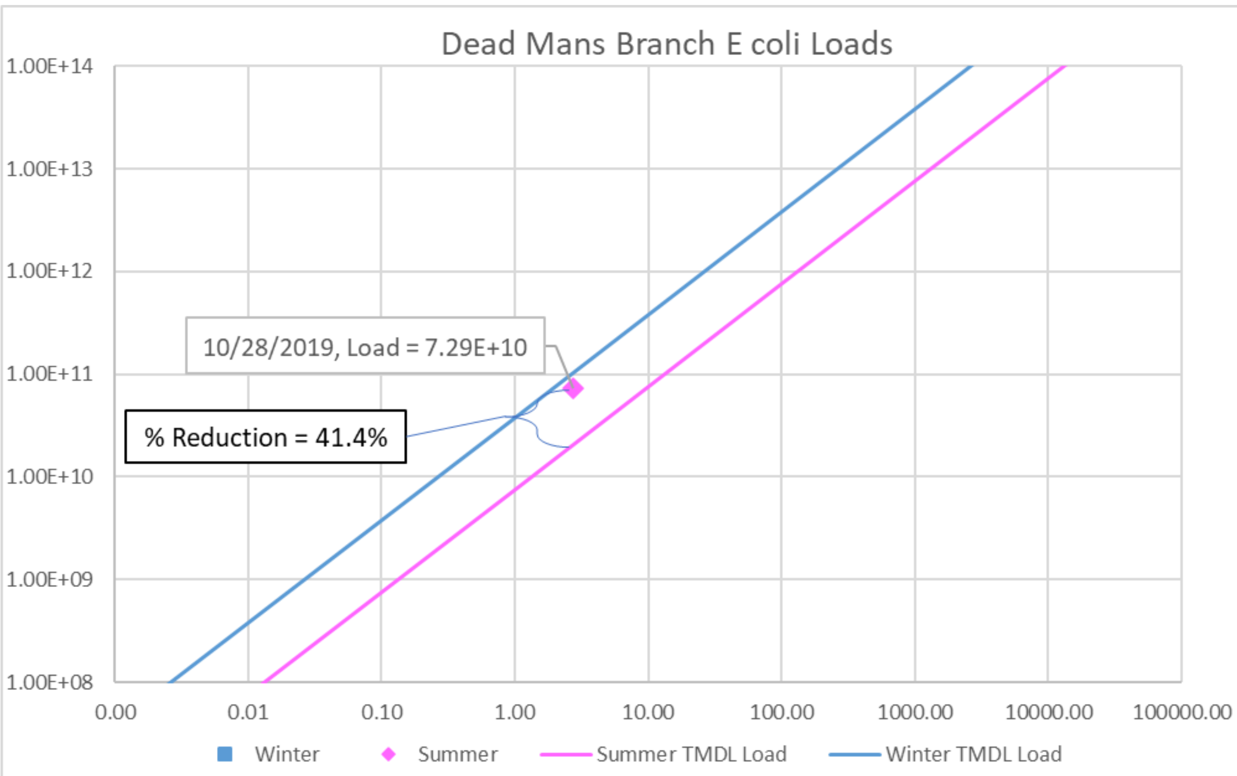

Figure B-3: Dead Mans Branch Fecal Coliform Geometric Mean Loads and Summer and Winter TMDL Curves for both Sampling Stations

Table B-4: RV_14_17574 – Etowah River at Eagles Beak Park near Hightower, GA Water Quality Monitoring Data

Date	Observed *E. coli* (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	*E. coli* Loading (counts/30 days)	TMDL *E. coli* Loading (counts/30 days)
08/05/2019	230	501.23	**233**	439	3.88E+12	2.09E+12
08/15/2019	70	409.30				
08/20/2019	**800**	366.62				
08/28/2019	230	479.34				
11/25/2019	500	549.38	101	502	1.91E+12	5.03E+12
12/03/2019	213	609.57				
12/05/2019	31	462.93				
12/09/2019	31	384.13				

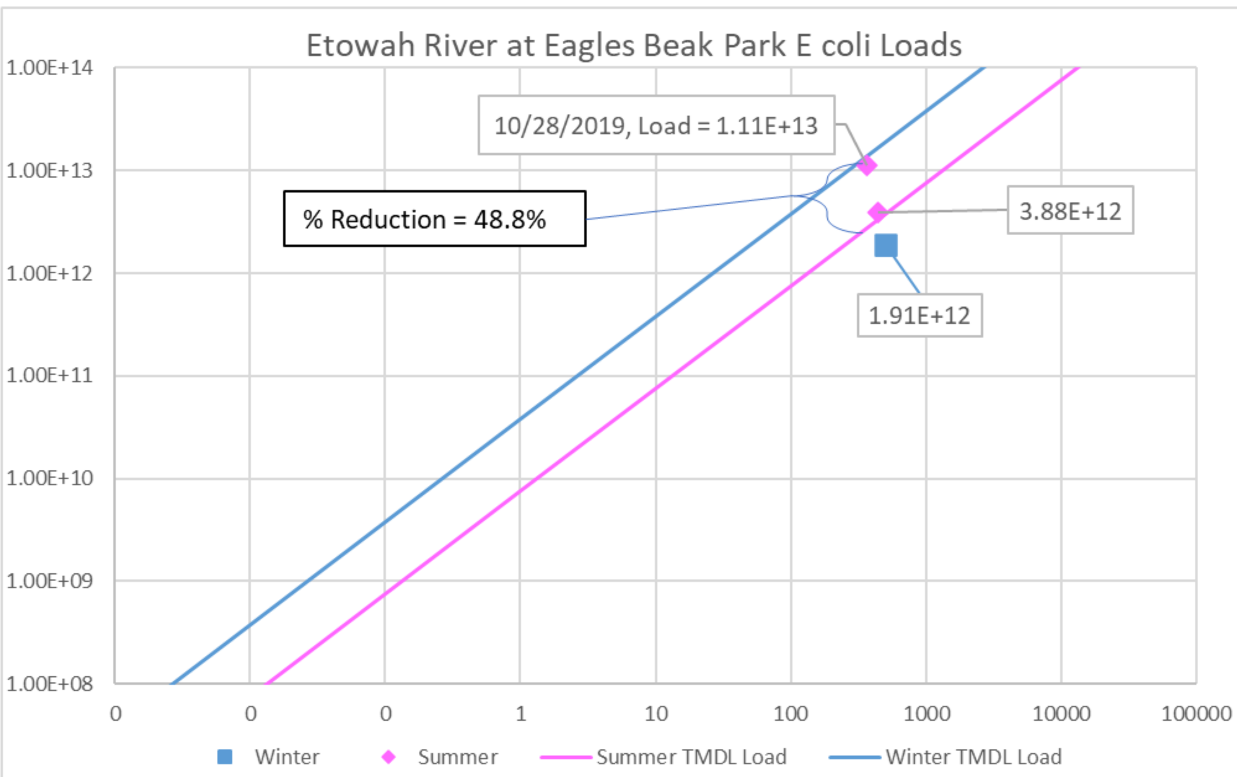

Figure B-4: Etowah River Fecal Coliform Geometric Mean Loads and Summer and Winter TMDL Curves for both Sampling Stations

Table B-5: RV_14_16423 – Etowah River at Kelly Bridge Road near Silver City, GA Water Quality Monitoring Data

Date	Observed *E. coli* (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	*E. coli* Loading (counts/30 days)	TMDL *E. coli* Loading (counts/30 days)
08/05/2019	40	466.98	**247**	409	3.83E+12	1.95E+12
08/15/2019	170	381.34				
08/20/2019	**1100**	341.57				
08/28/2019	**500**	446.59				
11/25/2019	220	511.85	44	467	7.77E+11	4.69E+12
12/03/2019	109	567.93				
12/05/2019	31	431.30				
12/09/2019	5	357.89				

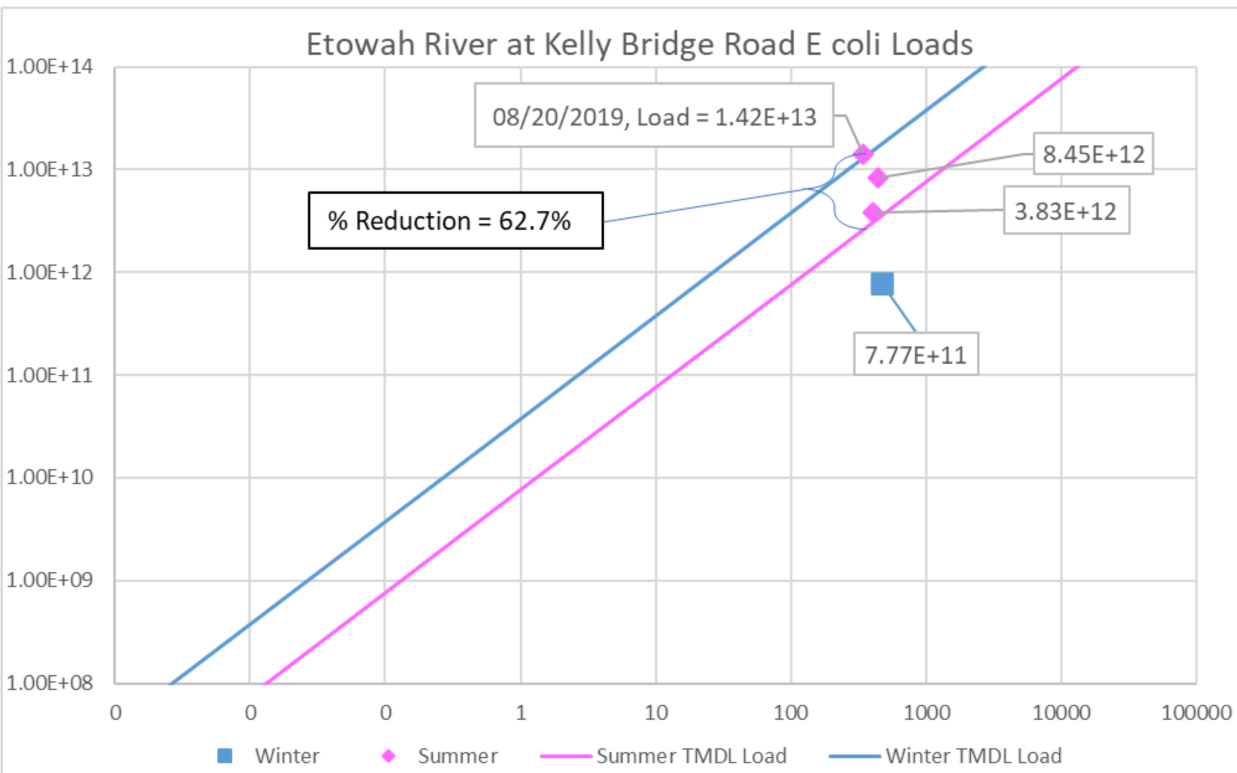

Figure B-5: Etowah River Fecal Coliform Geometric Mean Loads and Summer and Winter TMDL Curves for both Sampling Stations

Table B-6: RV_14_17277 – Fuller Branch at Riddle Mill Rd near Fairmount, GA Water Quality Monitoring Data

Date	Observed *E. coli* (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	*E. coli* Loading (counts/30 days)	TMDL *E. coli* Loading (counts/30 days)
09/05/2018	300	0.78	298	1	1.20E+10	5.09E+09
09/27/2018	**800**	1.46				
10/01/2018	110	0.95				

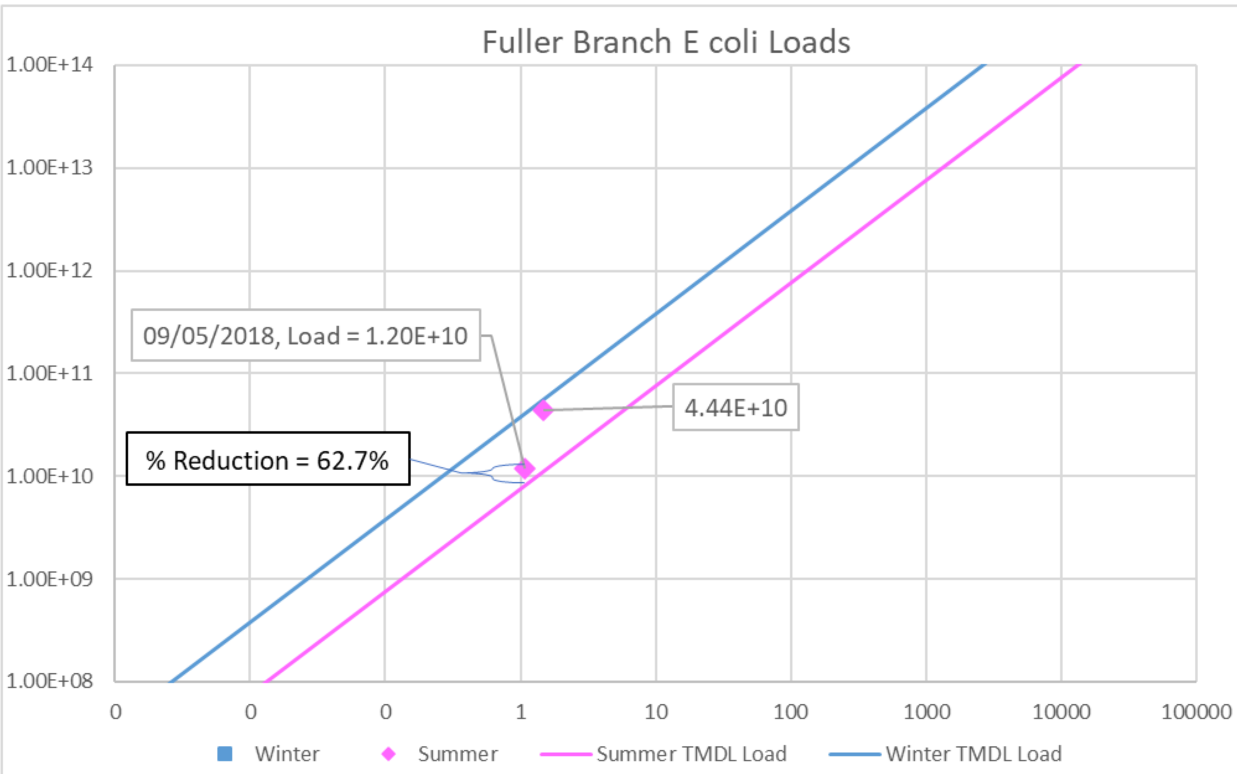

Figure B-6: Fuller Branch Fecal Coliform Geometric Mean Loads and Summer and Winter TMDL Curves for both Sampling Stations

Table B-7: RV_14_17275 – Redbud Creek at Red Bud Rd near Ranger, GA Water Quality Monitoring Data

Date	Observed *E. coli* (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	*E. coli* Loading (counts/30 days)	TMDL *E. coli* Loading (counts/30 days)
09/05/2018	300	1.62	**369**	2	3.08E+10	1.05E+10
09/27/2018	**800**	3.03				
10/01/2018	210	1.97				

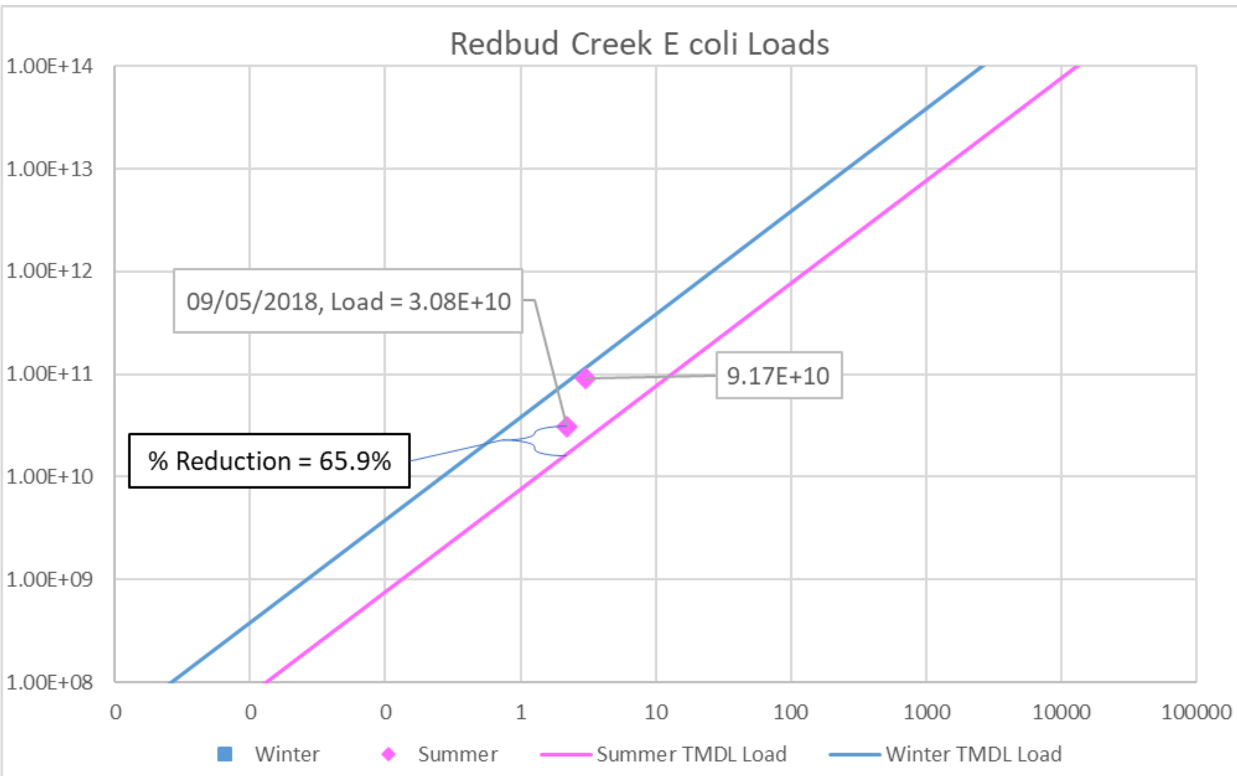

Figure B-7: Redbud Creek Fecal Coliform Geometric Mean Loads and Summer and Winter TMDL Curves

Table B-8: RV_14_4869 – Simpson Creek near Jackson Road near Rockmart, GA Water Quality Monitoring Data

Date	Observed *E. coli* (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	*E. coli* Loading (counts/30 days)	TMDL *E. coli* Loading (counts/30 days)
08/05/2019	**2300**	2.67	**638**	2	4.76E+10	9.40E+09
08/08/2019	**800**	1.87				
08/12/2019	300	1.46				
08/28/2019	300	1.89				
11/12/2019	**3000**	2.16	168	2	1.27E+10	2.02E+10
11/25/2019	80	2.79				
12/03/2019	31	1.65				
12/05/2019	52	1.33				
12/11/2019	341	2.12				

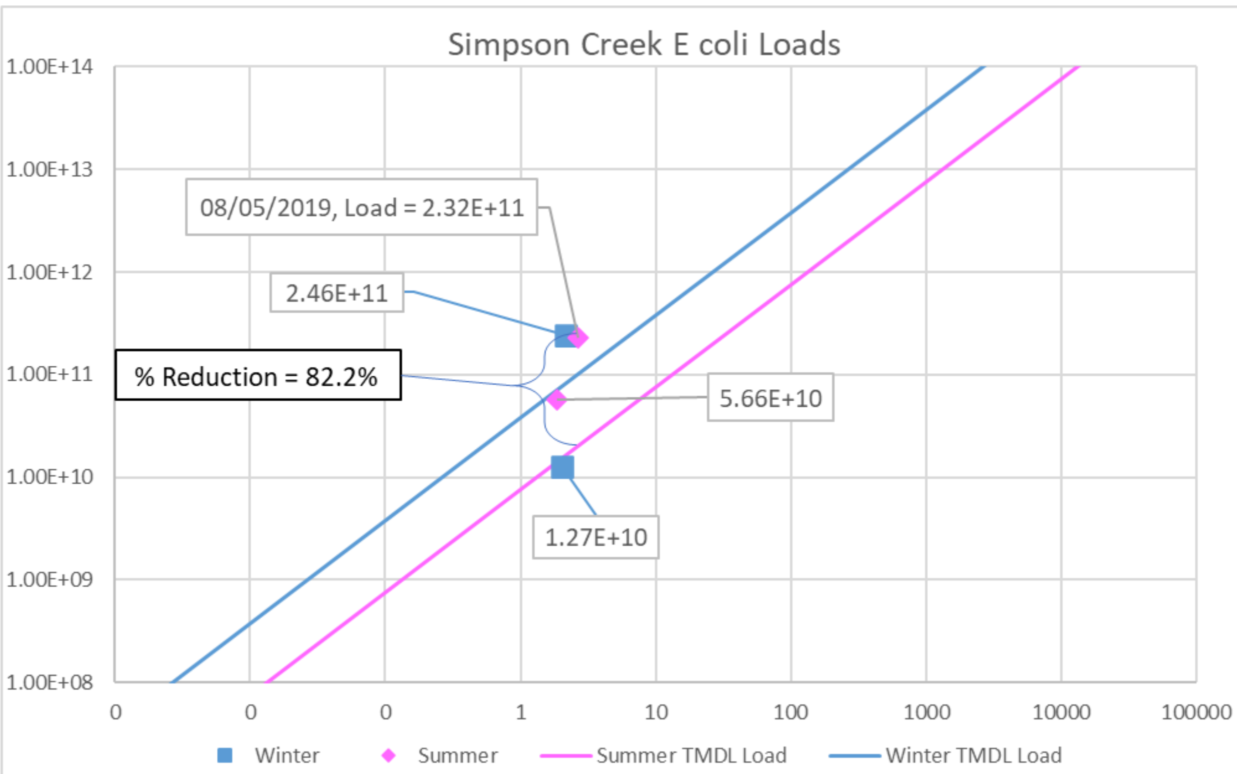

Figure B-8: Simpson Creek Fecal Coliform Geometric Mean Loads and Summer and Winter TMDL Curves

Table B-9: RV_14_16799 – Town Creek at Newton Creek Loop near Calhoun, GA Water Quality Monitoring Data

Date	Observed *E. coli* (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	*E. coli* Loading (counts/30 days)	TMDL *E. coli* Loading (counts/30 days)
03/12/2018	700	32.21				
05/07/2018	230	7.98				
09/05/2018	**13000**	3.59	**576**	7	1.61E+11	3.53E+10
09/27/2018	210	12.99				
10/01/2018	70	5.64				
11/08/2018	130	13.62				

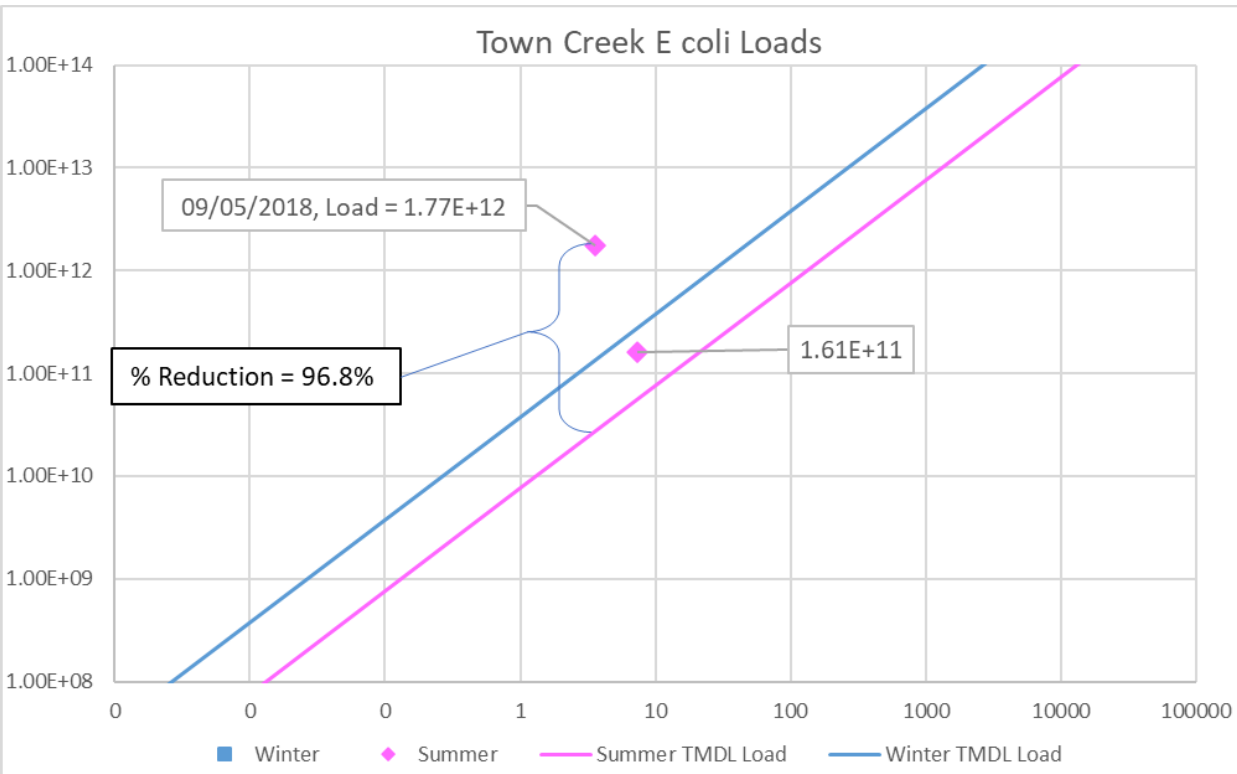

Figure B-9: Town Creek Fecal Coliform Geometric Mean Loads and Summer and Winter TMDL Curves